Re-assessing the South African household inflation expectations survey through a sequential mixed methods approach

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Research project in fulfilment of the requirements
for the degree of Masters of Economics
at the University of Stellenbosch

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Hugo Pienaar gratefully acknowledges financial support for this project from the National Research Foundation.

Declaration

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Date: December 2018

Abstract

Many central banks rely on survey-based measures of household inflation expectations as a gauge of policy credibility and an input for forecasting inflation. An accurate measure of the public's inflation expectations is therefore an essential instrument to guide policy. The public's perceived ignorance of inflation informed the choice of wording in the South African household inflation expectations survey, which launched in 2000. Based on the international critique against the use of simplified survey wording, this study evaluates the validity of the Bureau for Economic Research's (BER) household inflation expectations survey question. The study investigates whether South African households understand the term inflation, and the impact of providing a historical inflation number to the respondents in the survey question. This is done through a sequential mixed methods approach. Semi-structured, qualitative interviews were used to explore the public's understanding and perceptions of inflation. This was followed by a demographically representative, quantitative survey, which was used to reach generalisable conclusions.

The results of both the qualitative and quantitative stages of the study suggest that South African households have a far greater understanding of the term 'inflation' than previously assumed, although a large proportion do not understand the term adequately. Furthermore, when respondents are provided with historic information on inflation (as is done in the BER survey), survey wording has almost no impact on the public's inflation expectations. In the absence of an anchor number, survey wording is found to be (somewhat) more important. Without the anchor number, the mean inflation expectation is lower than when respondents are asked about their expectation for 'prices in general'. Both the descriptive statistics and the econometric analysis of this study show that the socio-economic characteristics of respondents play a role in influencing their inflation expectations. However, if outliers are removed from the data, the socio-economic factors have less influence on inflation expectations.

Table of contents

List of tables

List of figures

List of acronyms and abbreviations

BER	Bureau for Economic Research
BIE	Business Inflation Expectations Survey
CPI	Consumer price index
CREST	Centre for Research on Evaluation, Science and Technology
Fed	US Federal Reserve
ILO	International Labour Organisation
MPC	Monetary Policy Committee
OLS	Ordinary Least Squares
SA	South Africa
SARB	South African Reserve Bank
UK	United Kingdom
US	United States

CHAPTER 1
INTRODUCTION

The study of inflation expectations is important because these expectations provide a crucial input to the policy-making process of the world's leading central banks. This is due to the forward-looking nature of monetary policy and the effect expectations are believed to have on inflation itself. Furthermore, expectations provide a gauge of the credibility of monetary policy regimes.

The emphasis of central banks on managing inflation expectations - in the hope of controlling inflation - implies that accurate measurement of the public's inflation expectations is essential. Measurement limitations could result in policy errors, to the detriment of real output performance as well as the attainment of stated inflation targets.

Central banks have long relied on financial market-based inflation expectations that are derived from asset prices and available at a high frequency. An increasing number of central banks - especially those with an explicit inflation target - now also use survey-based measures of inflation expectations of different social groups (usually financial analysts, but also sometimes households and the business sector). In this thesis, the focus is on the wording of the South African household inflation expectations survey.

1.1 RESEARCH PROBLEM

There are a number of challenges to measuring household inflation expecations accurately, one of which is the concern about the general public's lack of knowledge about the term inflation (Shiller, 1996; Kershoff, 2000; Rossouw, Padayachee & Bosch, 2011). The public's perceived ignorance of inflation informed the choice of wording in household inflation expectations surveys in countries such as the United States (US), Australia and South Africa (SA) (Kershoff and Laubscher, 1999).

However, Bruine de Bruin et al. (2010) question the use of simplified wording in household inflation expectations surveys. This refers to the use of the phrase 'prices in general' in the survey question instead of asking directly about 'inflation'. Bruine de Bruin et al. (2010) argue that simplified survey questions that aim to compensate for the public's confusion about inflation may lead to survey answers that are not a true reflection of the public's inflation expectations because people understand the phrase differently.

Since the Bureau for Economic Research (BER) started the household inflation expectations survey for SA in 2000, the survey wording has remained unchanged, i.e. based on the wording of the University of Michigan survey in the US. The implications of this choice have not yet

been rigorously tested in the SA context. This study addresses the research gap. The study also investigates another specific choice made in the BER's survey wording which has the potential to impact on how respondents answer the question. This refers to the use of an 'anchor' number in the survey question to provide respondents with information on the latest historic inflation data.

1.2 RESEARCH QUESTION

This study is motivated by evidence that a change in the survey wording of household inflation expectations surveys has an impact on respondents' inflation expectations. For this survey data to be useful to policy makers, the measurement instrument (the BER's household inflation expectations survey question) needs to be valid, i.e. accurately measure what it was designed to measure.

In this thesis, the aim is to evaluate the validity of the BER survey question. More specifically, the main focus of the research is to compare households' understanding of the phrases 'prices in general' and 'inflation'. This is done to determine the extent to which the different survey wording influences the probablity that respondents' answers are a true reflection of their views about future inflation. The thesis also investigates whether the provision of an 'anchor' number has any impact on respondents' reported expectations. The BER survey is fairly unique among its peer surveys because it provides respondents with the latest available calendar-year CPI inflation rate. The question is whether the provision of an anchor number undermines the validity of the survey question.

The latter part of the thesis involves econometric modelling and looks at the extent to which socio-economic factors influence the public's expectations for inflation, and the ability of different groups to define the term inflation. To the extent that people with certain characteristics understand the term inflation better than others, the inflation expectations question provides more valid data for this group of respondents.

1.3 ORGANISATION OF THE STUDY

The rest of the study is structured as follows: Chapter 2 provides the literature review, and includes a discussion of the reasons why inflation expectations are important, how they are measured and the critique against the use of simplified survey wording.

Chapter 3 outlines the mixed methods methodology and provides a motivation for using this approach to answer the research question(s) of this study. Mixed methods combine both qualitative and quantitative research approaches. In this thesis, a sequential mixed methods approach is adopted, in which the researcher typically begins by collecting qualitative data.

Semi-structured, exploratory interviews were conducted to gauge the public's understanding and perceptions of inflation. In order to extract the most information from the interviews, a content analysis exercise was done (the qualitative data analysis phase). This was followed by a building phase, which focused on integrating the qualititve and quantitive phases meaningfully. In this thesis, the building phase involved using the information gathered from the content analysis to construct alternative questions for the BER's quantitative survey that is historically conducted quarterly by market research firm AC Nielsen[1].

For the quantitative survey, half of the BER survey respondents were asked to answer the BER's original survey question (i.e. on 'prices in general'), and the other half answered a question with adjusted wording that probed 'inflation' directly. The results were compared to determine the extent to which the survey wording, including the provision of an 'anchor' number, had any effect on how the public answered the expectations questions.

Chapter 4 presents the results and interpretation of the qualitative interviews and quantitative surveys. Both the qualitative and quantitative stages of the mixed methods process show that surveyed households in SA have a greater understanding of the term inflation than previously assumed, although a large proportion of the population does not understand the term adequately. Furthermore, whether one asks households about their expectations for inflation or some definition of inflation ('prices in general' in this case), the aggregated expectations are largely the same. This is the finding for the cross section used in this thesis; it may not necessarily hold true over time. In the SA context, the quantitative survey showed that when respondents are provided with information on recent inflation trends (in other words, an anchor), survey wording does not seem to materially influence the mean results of the household inflation expectations survey.

In Chapter 5, regression analysis is used to explore whether differerent socio-economic groups differ in their ability to define inflation, and whether socio-economic status has an influence on respondents' inflation expectations.

Chapter 6 concludes.

[1] Due to weak economic conditions, Nielsen can no longer guarantee that a survey is conducted every quarter.

CHAPTER 2
LITERATURE REVIEW

2.1 INTRODUCTION

This chapter provides a discussion of the academic literature that is relevant to this study. The first part of the chapter motivates why the study of inflation expectations is important, including that expectations influence the business cycle. The chapter then explores the important role of expectations in both the theoretical literature and macroeconomic policy. The theoretical literature was led by seminal papers by Fisher (1930) and Friedman (1968), but interest in developing new theories on how expectations are formed has attracted renewed attention recently. This is followed by a discussion of the crucial role of inflation expectations in the formulation and communication of central bank monetary policy.

Within the context of the literature on the role of expectations in theoretical models as well as the practice of monetary policy, the motivation for this thesis is then presented. It is argued that the survey wording in the Bureau for Economic Research (BER) household inflation expectations surveys is crucial to ensuring the validity of the data created. The interpretation of the survey data can only be made with confidence if one believes the instrument measures what it is designed to measure. This is followed by a discussion of the international literature on survey wording in household inflation expectations surveys, including the influence of an 'anchor' number in expectations formation. A detailed summary of the critique expressed against the University of Michigan inflation expectations survey, especially its use of the term 'prices in general', is provided. This is important since the wording of the BER survey question is strongly influenced by the Michigan survey. The final section concludes the chapter.

2.2 MOTIVATION FOR STUDYING INFLATION EXPECTATIONS

There is general consensus that expectations of future inflation influence consumption and saving decisions, as well as the broader business cycle (Van der Klaauw, Bruine de Bruin, Topa, Potter & Bryan, 2008:57; Cavallo, Crucas & Perez-Truglia, 2016:2). Because expectations affect the macroeconomy, they necessarily become relevant to monetary policy too. In fact, the expectations channel of the monetary policy transmission mechanism has become widely recognised as crucial to the effective implementation of monetary policy (Woodford, 2005). Often, the monetary policy stance is determined by how expectations evolve.

More broadly speaking, the evolution of inflation expectations helps to improve our understanding of inflation as a process (Mohr, 2008b), while assisting with inflation forecasting (Woodford, 2005; Clouse, 2018). Mohr (2008b) defines inflation as a 'continuous (and

significant) increase in prices in general' and then emphasises that inflation is a process, highlighting the role of expectations in the evolution of inflation. As a flexible inflation targeter, the South African Reserve Bank (SARB) has repeatedly said it generally looked through the first-round effects of exogenous supply shocks on inflation. The focus of monetary policy is on how these shocks feed through to higher inflation expectations and ultimately wage and price setting (often referred to as second-round effects). Managing inflation expectations to a lower level is important. Unless the wage and price setters in the economy lower their expectations, wages will be at a higher level. This would create the risk of a self-fulfilling outcome of higher inflation (Kganyago, 2018:6).

An appreciation of the influence of inflation expectations provides valuable insight into historical episodes of high inflation, as well as deflation. Unanchored expectations played an important role in the high global inflation of the 1970s (Solow, 1979). Elevated inflation expectations in the 1970s can also be linked to the subsequent high output costs of tighter monetary policy in the 1980s (Poole, 2005). Aggressive policy interest rate increases, especially under Paul Volcker's leadership of the United States Federal Reserve (Fed), were required to bring actual inflation under control. Inflation expectations that are too low for a prolonged period can also have adverse implications for macroeconomic performance. Piazza (2015) highlights the role that unanchored inflation expectations played in the prolonged periods of deflation suffered by Japan since the 1990s.

2.3 APPLYING INFLATION EXPECTATIONS TO ECONOMIC THEORY

The emphasis on inflation expectations is deeply rooted in economic literature. Fisher (1930) was one of the first to focus on expectations, most notably in the theory of Uncovered Interest Parity. The theory states that interest-rate differentials between countries are the major determinants of longer-term exchange rate values. Fisher (1930) also showed that the nominal interest rate could be decomposed into the real interest rate plus inflation expectations (the so-called Fisher equation). This suggests that by managing inflation expectations, policy makers can influence nominal interest rates (Reid, 2011). Because of reduced risk premiums, real interest rates can also move lower when inflation is stable at lower levels (Kganyago, 2018:5).

In a seminal Presidential Address to the American Economic Association, Friedman (1968) also highlighted the importance of inflation expectations. He challenged the consensus view amongst academics at the time that an increase in the money supply would result in lower interest rates than would be true under conditions of stable money supply growth. Friedman argued that if faster money supply growth resulted in higher prices, the public was likely to adjust their expectations and assume further price increases. Because of an expectation for continued price increases, borrowers would be willing to pay higher interest rates. For the

same reason, lenders would demand a higher interest rate. Over time, and contrary to popular belief, a rise in the quantity of money would be followed by higher interest rates (Friedman, 1968:6).

Friedman also used expectations of inflation to show that the theory behind the celebrated Phillips curve contained a very basic defect, namely the failure to distinguish between nominal and real (or inflation-adjusted) wages. The original Phillips curve, published in an *Economica* article by Phillips (1958), argued for both a short- and long-run stable tradeoff between wage inflation and employment. Higher inflation was likely to result in increased employment, while a slowdown in inflation would be accompanied by weaker employment outcomes. Underlying this theory was the acceptance that nominal price expectations would remain stable no matter what happened with actual prices and wages (Friedman, 1968:8). Friedman showed that the relationship between inflation and employment broke down when it was assumed that economic agents would raise their expectations of future price rises once actual prices started to increase. Put differently, in reaction to actual developments, agents adapt their expectations of future price trends. This interpretation of the inflation-output relationship became known as the expectations-augmented Phillips curve.

During the same time, the importance of inflation expectations in the macro policy environment – especially for disinflation policies – was emphasised. Restrictive fiscal policy that leads to an underutilisation of productive capacity in the economy will only be optimal in an environment where the expected rate of inflation is higher than the optimal or targeted inflation rate (Phelps, 1967:280). The basic idea put forward by Friedman and Phelps was that, if inflation was correctly anticipated, the unemployment rate would reach its long-term equilibrium level, also referred to as the natural rate of unemployment. Under these conditions, fiscal and monetary policy could not be used to sustain employment at a pre-determined rate greater than the natural rate, at least not over the long term.

Lucas (1976) expanded on the earlier work on expectations, arguing that the theory of adaptive expectations will only hold true in an environment of reasonable stability in price increases. He sought to determine how expectations are revised and how to model these expectations when there is a lack of price stability (Lucas & Rapping, 1969). This led to the formation of the rational expectations theory, i.e. model-consistent expectations. Amongst others, the Lucas critique expanded the analysis of the trade-off between inflation and unemployment from a partial equilibrium framework that focused on the demand and supply of labour to a general equilibrium framework based on theoretic microeconomic relationships that included other sectors of the economy. In this model, observed prices and quantifies are assumed to always be market-clearing (or equilibrium) outcomes.

According to Lucas, when rational expectations are assumed, the long-run Phillips curve is vertical. The implication is that there is no tradeoff between inflation and unemployment over the long term. This is because the expectations of economic agents are now assumed to take account of all the relevant information, including the future implications of current policies and policy changes. By implication, Lucas shows that expectations influence real output trends. Crucially, policy makers recognise that people do not simply respond to historical policy (adaptive expectations). At least part of the time, they anticipate policy changes and the subsequent impact on them. Once this was appreciated, policy makers had to think in a strategic manner about communicating and implementing policy decisions.

However, since the global financial crisis of 2008 to 2009, the assumption of rational expectations – still the assumption most widely used in mainstream economic models – has been strongly criticised (Vines & Wills, 2018). Bernanke (2007) argues that in the modern context of inflation expectations, the rational expectations theory is less useful. This is explained by constant changes in the structure of modern economies that are not well understood. Limited public knowledge of the central bank's objective function further argues against the theory of rational expectations.

Today, even with more data on inflation expectations (partly from survey data), there are still diverging opinions on how inflation expectations, especially those of households, are formed. Evidence from inflation expectations surveys highlight significant heterogeneity in individual survey responses. Across individuals, this may be due to differences in the information they possess when forming expectations (see, for example, Mankiw, Reis & Wolfers, 2003; Van der Klaauw et al., 2008:62-65). In a survey conducted of firm managers in New Zealand, Kumar, Afrouzi, Coibon and Gorodnichenko (2005:154) showed that about 90% of managers said personal shopping experience was very or extremely important to inform them of inflation trends. Because each individual has a unique shopping experience and information set, it contributes to an understanding of the heterogeneity seen in household and firm inflation expectations. This also links to the rational inattentive literature as outlined by Sims (2003). Rowe (2016) shows that short-term inflation expectations are influenced by recent perceptions of inflation. Broader macroeconomic factors, including central bank inflation targets, inform longer-run expectations.

For South Africa (SA), Ehlers and Steinbach (2007:24) found that the inflation expectations of financial analysts, business executives and trade union officials are formed by '…combining some features of rationality with adaptive behaviour in order to minimise their forecast errors over time, subject to their respective available resources'. Kganyago (2018) refers to the persistence of SA inflation expectations, arguing that to the extent that expectations are

backward looking, in an environment where actual inflation is trending upwards, it might take time for inflation expectations to sustainably decline to a lower level.

Besides the lack of clarity on how expectations are formed, uncertainty exists about the most appropriate way to influence them (see Bernanke, 2007; Burke & Manz, 2011). In part, this is a function of how little we know about the general public's understanding of the inflation process. Bernanke (2007) argues that '…a fuller understanding of the public's learning rules would improve the central bank's capacity to assess its own credibility, to evaluate the implications of its policy decisions and communications strategy, and perhaps to forecast inflation'.

In summary, a number of important theories in economics are based on an understanding of the role of expectations. While the academic theory about inflation expectations was developing, the practice of monetary policy was evolving (sometimes ahead of the theory) in acknowledgement of the role of expectations. The focus of the next section is on the interaction between inflation expectations and monetary policy.

2.4 INFLATION EXPECTATIONS AND THE PRACTICE OF MONETARY POLICY

Starting with the Reserve Bank of New Zealand in the early 1990s, the adoption of inflation targeting as a framework for monetary policy in a growing number of countries has elevated the importance of managing inflation expectations in the conduct of monetary policy. This is emphasised by Woodford (2005: 15):

> 'For successful monetary policy is not so much a matter of effective control of overnight interest rates as it is of shaping market expectations of the way in which interest rates, inflation, and income are likely to evolve over the coming year and later… Not only do expectations about policy matter, but, at least under current conditions, little else matters.'

Evidence for Woodford's comment is visible in the daily movements of global currency, equity and capital markets. Markets are prone to react more to communication from policy makers about possible future policy changes, or the release of economic data that influences these expectations, than to the subsequent actual policy announcements. This can be seen as a direct outcome of increased openness and transparency in the communication of monetary policy authorities, both in the United States (US) and other inflation-targeting central banks (Woodford, 2005:56).

Accurate and consistent measurement of inflation expectations provide an important source of information for appropriately calibrating monetary policy and deepening our understanding of

broader economic behaviour (Bernanke, 2007; Bryan, Meyer & Parker, 2015:2). Bernanke (2013) makes an even stronger case for expectation management by arguing the following:

> 'The effects of monetary policy on the economy today depend importantly not only on current policy actions, but also on the public's expectations of how policy will evolve… Indeed, expectations matter so much that a central bank may be able to help policy be more effective by working to shape those expectations.'

The Fed often highlights the importance of expectations. The minutes of the January 2018 meeting of the Fed's Federal Open Market Committee noted that the participants had agreed that 'inflation expectations played a fundamental role in understanding and forecasting inflation, with stable inflation expectations providing an important anchor for the rate of inflation over the longer run' (Clouse, 2018).

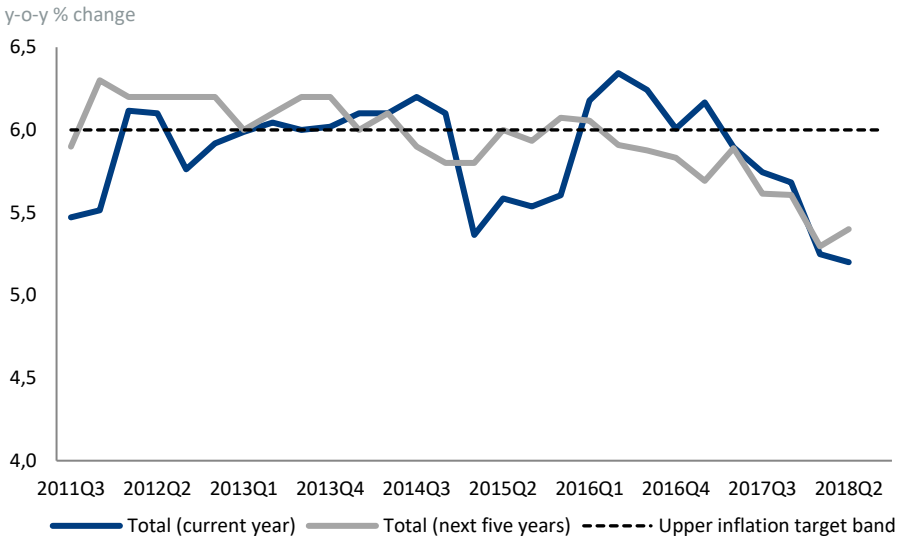
A number[2] of inflation-targeting central banks, including the SARB[3], use inflation expectations surveys as a gauge of policy credibility and the likely future path of inflation (Ehlers & Steinbach, 2007). After reviewing the literature on inflation-targeting monetary policy frameworks, Kershoff and Laubscher (1999) came to a similar conclusion. In SA, the formal adoption of inflation targeting as the cornerstone of monetary policy in February 2000 elevated the role of inflation expectations in the domestic policy context. Former SARB Governor Tito Mboweni argued that inflation targeting was fundamentally about managing inflation expectations (Katzenellenbogen & Grawitzky, 2000). In order for the SARB to be successful in not only influencing the short-term nominal interest rate, but interest rates along the entire yield curve, it needs to manage expectations of both the future real interest rate and inflation. As a result, managing inflation expectations is of paramount importance for effective monetary policy (Reid & Du Plessis, 2010:1).

The success of SA's inflation-targeting regime largely depends on how the public's inflation expectations evolve (Kabundi, Schaling & Some, 2014). In particular, the extent to which expectations react to transitory supply-side shocks provides important clues about the credibility of the central bank's policy. In a credible policy environment, a higher current inflation rate because of, for example, a sharp rise in the international price of oil should not influence long-term inflation expectations. When the monetary policy regime is seen to be credible, long-term expectations are likely to remain close to the targeted inflation rate. A lack of policy credibility will result in volatile long-term inflation expectations with temporary shocks to inflation also having an impact on inflation expectations (Kabundi et al., 2014:4). If inflation expectations in SA were anchored at the midpoint (4.5%) of the SARB's 3 to 6% inflation target,

[2] These include the Bank of England, the European Central Bank, the Reserve Bank of Australia, the Bank of Japan, the Reserve Bank of India, and Sweden's Riksbank.
[3] The bi-monthly statement of the SARB's Monetary Policy Committee that follows a policy interest rate meeting usually contains a paragraph that elaborates on the latest financial market and survey-based inflation expectation trends.

it would allow the central bank to look through supply-side shocks that threaten the inflation outlook to an even greater extent than is currently the case (Naidoo, 2017).

Figure 2.1: SA current year and five-year ahead inflation expectations



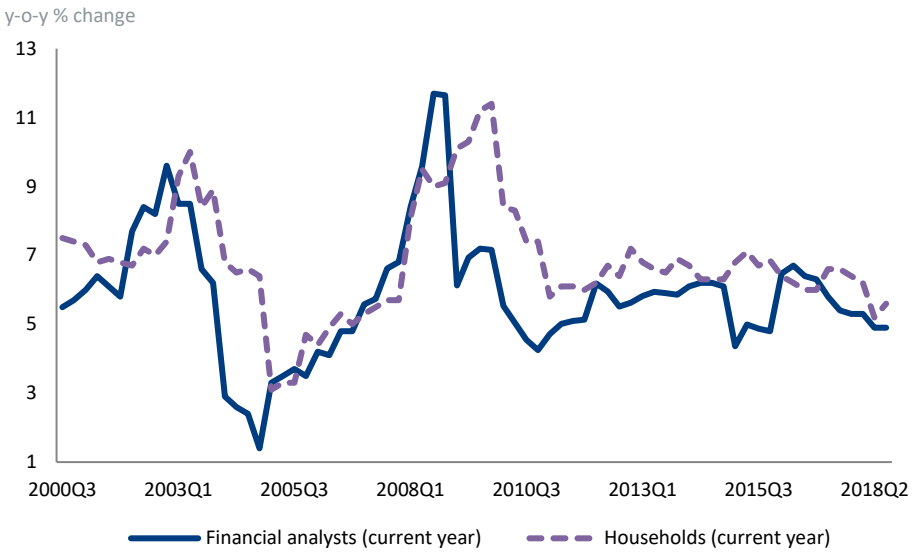
Note: Total refers to the average expectations of analysts, firms and trade unions.
Source: Bureau for Economic Research

The BER does not ask households about their five-year ahead inflation expectations. However, since the third quarter of 2011, financial analysts, business executives and trade unions have been asked this question. Figure 2.1 plots the history of this survey and compares it to the expectation of these social groups for inflation in the current year, i.e. a measure of short-term inflation expectations. The current and five-year expectations have both averaged 5.9% since 2011, i.e. at the top end of the SARB's 3-6% inflation target. However, the current-year expectation has at times been more volatile than the longer-term expectation.

Notwithstanding the broad agreement about the role of expectations in policy circles, there is some debate among academics about the predictive power of inflation expectations for actual future inflation outcomes. A significant literature (see, for example, Clark & Doh, 2011; Faust & Wright, 2013) finds a strong correlation between expectations and actual inflation outcomes. This finding is not universally accepted. Kumar et al. (2005) questions the relationship between the inflation expectations of firm managers and actual inflation outcomes in New Zealand. In the case of the United Kingdom (UK), Rowe (2016) found that, especially over the longer term, the relationship between expectations and actual consumer price index (CPI) outcomes is not statistically significant.

In the case of the US, an important reason for the discrepancies between perceived and actual measures of inflation may be that many consumers do not experience inflation as measured by the CPI (Ranyard, Missler, Bonini, Duxbury & Summers, 2008:382). CPIs are based on expenditure weights of average prices across a number of product categories. The greater the expenditure on a specific category, the higher the weighting attached to it. The implication is that the CPI is typically more representative of the spending patterns of households in the upper percentiles of the expenditure distribution than those that have lower levels of income. This is referred to as the plutocratic concept of index weighting (International Labour Organisation, 2004:337). The prices of products that are purchased more regularly are weighted more in inflation judgements. Perceived inflation has been found to be higher for goods reported to be purchased more frequently (Jungermann et al., 2007).

Figure 2.2: Inflation expectations of households and financial analysts



Source: Bureau for Economic Research

In SA, household inflation expectations have (on average) been about one percentage point (6.8% versus 5.8%) higher than financial analysts' expectations (see Figure 2.2)[4]. This may simply reflect the fact that analysts are more informed about the recent inflation trends and in a better position to project future trends. However, households are provided with the historic CPI inflation data in the BER survey. Strictly speaking, the results are not fully comparable as households are asked about prices in general whereas financial analysts answer a question about the headline inflation rate. It could be that the phrasing of the question in the household

[4] The divergence between household and analyst inflation expectations is in line with the international experience (Thomas & Grant, 2008).

survey explains the difference. The wording of household inflation surveys is the primary focus of this study and is explored in more detail later.

In summary, inflation expectations are used extensively in practice to understand the macroeconomy and to implement monetary policy. The correct measurement of expectations is important, a topic that is discussed next.

2.5 MEASURING INFLATION EXPECTATIONS

While inflation expectations play an important role in shaping monetary policy decisions, measurement issues make it a challenging concept. Solow, Taylor and Mankiw (2009: 83) perhaps says it best:

> '…here is a concept that seems in our minds to play an important role in macro behaviour, and yet it's very difficult to deal with because it escapes observation and it even escapes clear definition'.

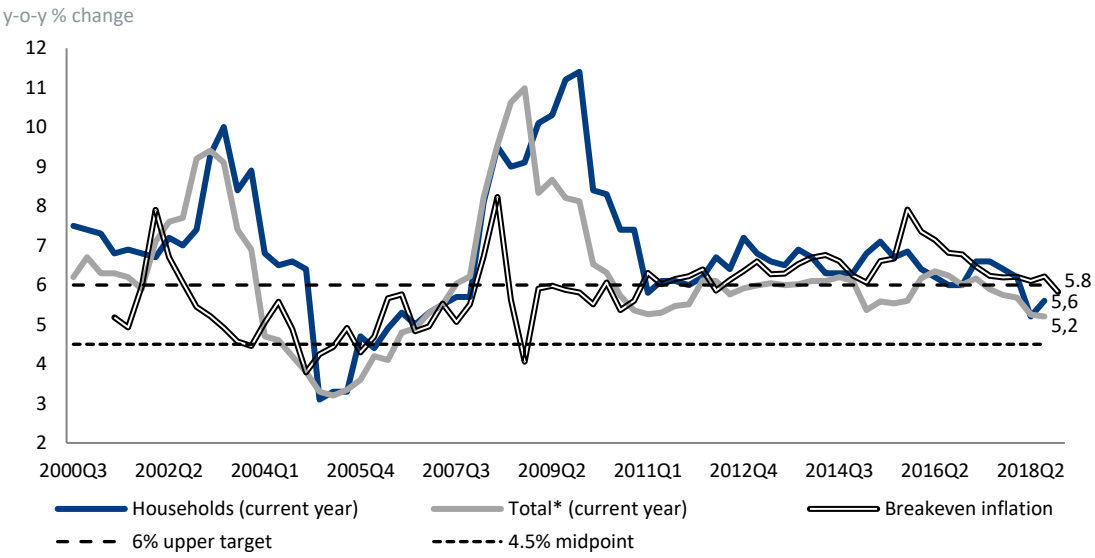
There are two main ways of measuring inflation expectations, namely financial market-derived expectations and survey-based measures of analysts, households and firms. In SA, the inflation expectations of trade union representatives are also surveyed. Figure 2.3 compares financial market and survey-based measures of inflation expectations for SA. Expectation surveys are usually conducted monthly or quarterly by the central bank or a private-sector firm with expertise in this field. The surveys typically ask professional forecasters, households and firms questions about their expectations for some measure of inflation over the next 12 months and beyond. Most of the critique in the academic literature is aimed against survey-based measures, most notably of households and in some cases also firms.

Bullard (2016) is a known critic of survey-based measures, especially household inflation expectations. Even so, he agrees that modern economic theory is clear on the important role of inflation expectations in determining actual inflation outcomes. Bullard, President of the St. Louis Federal Reserve Bank in the US, favours the financial market-based measures of inflation expectations. Market-based measures are derived from the movement in selected government bond yields, or treasury bonds as they are referred to in the US. A nominal security, such as the 10-year SA government bond (R186), and a real (or inflation-adjusted) security with the same maturity (R197 in the case of SA) both trade in the market. The yield spread between these two securities is interpreted as the capital market's expectation of inflation over the horizon of the security. In line with the international norm, the SARB Monetary Policy Committee (MPC) statements refer to this measure as the breakeven inflation rate[5].

[5] Reid (2008a) introduces an alternative market-based measure of inflation expectations for SA by calculating the difference between nominal and (constructed) real forward interest rate agreements (FRA's).

The MPC statements usually quote both the latest quarterly BER inflation expectations survey results and the most recent breakeven inflation rate. Bullard (2016) argues that the breakeven measure of expectations is more informative than survey-based measures because it tends to react more to the latest information about the economy[6]. Therefore, the breakeven measure may provide an earlier indication of a change in inflation expectations[7]. Svensson (1997) stresses that the high frequency and accuracy of market-based measures of inflation expectations are important advantages.

Figure 2.3: Financial market and survey-based measures of SA inflation expectations



Note: *Average of analysts, firms and trade unions
Sources: Inet, Bureau for Economic Research

While the central bank needs to consider the expectations of the financial markets, the inflation expectations of the general public also have a bearing on whether monetary policy is able to achieve its objective of price stability (Reid, 2011). This is because, along with firms, the behaviour of the public influences price setting in the economy. Furthermore, it is the public who provides legitimacy and independence to the central bank (Blinder, Ehrmann, Fratzscher, De Haan & Jansen, 2008).

Although it is true that the inflation expectations of households (or groups other than the financial analysts) are difficult to measure, it is not clear that this is a reason not to pay attention

[6] This critique is mostly aimed at surveys of household inflation expectations. At least in the case of the BER's quarterly survey, the analysts surveyed do tend to adjust their expectations in line with the most recent actual inflation trends. In the US, this is also true of the analysts that participate in the Survey of Professional Forecasters conducted by the Philadelphia Federal Reserve Bank.
[7] On occasion, a concern raised with the breakeven measure is that it also reflects differences in the liquidity and risks associated with nominal and real securities. In other words, it may be the case that it is the liquidity and risk premium that is reacting to incoming data rather than inflation expectations. Bullard (2016) is not convinced by this argument.

to them. An important measurement question is the wording used in household inflation expectations surveys. This is discussed next.

2.5.1 Expectation formation: The importance of survey wording

There seems to be at least some agreement amongst the public about the importance of keeping inflation in check (Shiller, 1996). Shiller refers to the Gallup Poll in the US, which during the 1970s and early 1980s (a period of high US inflation) consistently showed that more than 50% of respondents viewed inflation as the most important problem facing the country. Nevertheless, after conducting surveys in the US and Germany, he referred to the public as being 'vulnerable to fundamental confusions about inflation' (Shiller, 1996:6). In the case of Israel, surveys done by Leiser and Drori (2005) found that although respondents showed some understanding of the relationship between inflation and other relevant economic concepts, their understanding was not deep.

In line with these results, after analysing SA household inflation expectations and conducting two inflation credibility surveys in 2006 and 2008, Rossouw et al. (2011) argued that respondents may have confused price levels and price increases, or inflation. This conclusion was reached after the inflation credibility surveys somewhat surprisingly showed that there was a low acceptance that historic inflation figures were accurate during times of moderate (low) inflation[8]. These conclusions are in line with earlier work by Kershoff (2000), who also expressed concern about the SA public's comprehension of the widely used term inflation.

Van der Klaauw et al. (2008) conclude that part of the heterogeneity of household inflation expectations may not reflect differences in what respondents believe about future inflation, but rather in how they define it. Therefore, diverse interpretations of the question asked in inflation expectations surveys increase the difficulty of understanding observed changes in inflation expectations between surveys (Van der Klaauw et al., 2008:17). This highlights the importance of survey wording, particularly in cases where terms are used that the general public may not be familiar with. The Pew Research Centre in the US argues that the creation of questions that accurately measure the opinions, experiences and behaviours of the public should be seen as the most important part of conducting a survey (Kennedy, 2017). Therefore, it is important that the phrasing of the survey questions does not result in different interpretations by the respondents. This is in order to ensure that the results are a true reflection of society's beliefs.

From a monetary policy perspective, the interpretation of the results from household inflation expectations surveys poses a challenge if it is unclear exactly what the general public

[8] The authors acknowledge that greater clarity on whether this conclusion is valid will only emerge once inflation credibility surveys have been done over a number of high and low inflation cycles.

understands when the term inflation, or price changes, is used. With this in mind, the wording in the questionnaire of household inflation expectations surveys is of particular importance. The decision to, for example, ask the public about their expectation for 'inflation', as opposed to the 'general price level', 'prices in general' or 'average price level', may lead to confusion and influence how the public answers questions about their inflation expectations. Before deciding on the wording in expectations surveys, it is therefore important to get a sense of the public's understanding of the topic that they are being asked to comment on. This is particularly relevant in cases where the public is expected to provide a forecast.

In other words, the wording of questions can impact the reliability[9] of the survey results (Alwin & Krosnick, 1991). Bruine de Bruin et al. (2010) argue that 'reliable measurement requires that respondents agree with one another, and with economic modelers, on what the survey question (as well as their responses to it) means. If respondents have different interpretations of a question, their responses may indicate greater disagreement.'

These arguments are supported by Biau, Dieden, Ferrucci, Friz and Linden (2010) who provide evidence for Spain that indicates how the results of inflation expectations surveys are sensitive to the formulation of the question wording. They refer to an experiment that was conducted in 2005. The European Commission's open-ended inflation expectations question, namely 'By how much percent do you expect consumer prices to go up/down in the next 12 months?', was adjusted. Whereas the normal question is open-ended, in the experiment respondents were given a number of options, ranging between 0% and 10%. The inclusion of the options in the question provided a range of answers that was much closer to actual inflation trends. As a result, the main conclusion was that the current, open-ended wording of the European Commission survey led to more dispersed responses (Biau et al., 2010:6).

2.5.2 A global perspective on survey wording

Table 2.1 provides a summary of the survey questions used to measure household inflation expectations in a number of countries. The survey questions of thirteen institutions across eleven countries are considered. The sample includes advanced and emerging countries. After conducting this exercise, it quickly became apparent that there was a wide range of question wording. Canada, New Zealand, India (the qualitative question) and the New York Federal Reserve Bank are the only ones that ask respondents a question directly about their expectation for inflation.

[9] The Oxford dictionary defines reliability as 'the degree to which the result of a measurement, calculation, or specification can be depended on to be accurate'. In terms of the relevance to survey results, Alwin and Krosnick (1991:141) refer to the concept of psychometric reliability. Broadly, they define psychometric reliability as a situation where there is correlational consistency in responses that is independent of true individual change. In this case, reliability is compromised by random errors only.

Of the surveys considered, the most recently created one is for Canada. In 2014, the Bank of Canada launched the Canadian Survey of Consumer Expectations. Previously, only the inflation expectations of firms and professional forecasters were surveyed in Canada. The survey wording in Canada was heavily influenced by the research done by Bruine de Bruin et al. (2010) at the New York Federal Reserve Bank. The research was deemed cutting edge in survey design (Gosselin & Khan, 2015). A detailed discussion of this work is provided in the next section.

Of those considered, six surveys ask about prices in general or some hybrid of it. One (the European Commission's survey) asks about consumer prices. One (Sweden's) asks about prices, but elaborates that this refers to inflation. Two (Bank of Japan and Australia's) ask about the prices of goods that consumers buy. Finally, seven of the surveys (more than half in this sample) ask both a qualitative and quantitative question.

In the US, one of the longest running formal household inflation expectations surveys is undertaken by the University of Michigan. The questions about inflation expectations form part of the monthly consumer confidence survey conducted by the university. This is a nationally representative monthly random survey of around 500 households. Historic data is available from January 1978. On inflation expectations, the Michigan survey asks each household both a qualitative and a quantitative question:

> *Qualitative: During the next 12 months, do you think that prices in general will go up, or go down, or stay where they are now? If respondents answer that prices will go up or down, a follow-up quantitative question is asked: By about what percent do you expect prices to go (up/down) on the average during the next 12 months?*

In SA, the BER at Stellenbosch University has conducted a quarterly inflation expectations survey since 2000. The survey is done on behalf of the SARB. The BER directly surveys financial analysts, business executives and trade unions. A posted and emailed questionnaire is sent to the respondents every quarter[10]. The BER also surveys household inflation expectations. This is done by AC Nielsen, a Johannesburg-based firm that specialises in market research. AC Nielsen conducts individual face-to-face interviews with a representative panel of 2 500 households. The panel of households that are surveyed changes every time the survey is done. It is possible to survey the same people again, but this comes at an additional cost. The interviews cover black and white respondents in metropolitan areas, cities, towns and villages, and Asian and coloured respondents in metropolitan areas.

[10] For a detailed overview of the BER's survey, see Kershoff (2000).

The AC Nielsen survey is done monthly, but the BER household inflation expectation question is asked once a quarter. The BER question is added to a longer questionnaire that AC Nielsen's 2 500[11] respondents are interviewed on. Besides the BER's inflation question, the other questions include demographic trends. This type of questioning is referred to as an omnibus survey. It is a method of quantitative marketing research where data on a wide variety of subjects is collected during the same interview. It is also referred to as a piggyback survey as multiple clients share the cost of conducting the survey[12]. Households are asked the following question on inflation:

> *By about how much do you expect prices in general to increase during the next 12 months?*

The BER question does not mention the word 'inflation' at all. In justifying the wording of the BER household inflation question, Kershoff (2000) argued that it was not feasible to directly ask households what they expected inflation would be in future, as too few respondents would understand what was meant by inflation[13]. It was decided to follow the University of Michigan, as well as the New York-based Conference Board's examples and rather ask households about their outlook for prices in general[14]. The question is only phrased this way in the case of households. In the questionnaire that the BER sends to the other social groups, including financial analysts, the question relates directly to inflation[15] and asks:

> *What do you expect the average headline inflation rate (as measured by the percentage change in the CPI) to be during 2018 and 2019?*

[11] The same people are not surveyed every month or quarter. In contrast, the Michigan survey does have a panel aspect as about 200 of the 500 respondents each month are from the survey sample six months before. The other 300 are new respondents.
[12] On occasion in recent years, AC Nielsen has not received sufficient interest from firms other than the BER to do a survey every month of the year. This has meant that the BER has (periodically) been forced to make use of other survey providers to conduct the household inflation expectations survey.
[13] In a similar vein, central banks such as the SARB and the Bank of Thailand justify the use of headline inflation as their inflation target measures as opposed to, for example, targeting core inflation. They argue that the headline measure is easier to communicate to the public than a measure that excludes certain items (SARB, 2018).
[14] The Bank of England's inflation expectations survey, done by TNS, asks about 'prices in the shops generally' as opposed to 'the inflation rate' or a specific measure of inflation.
[15] Household inflation expectations do not form part of the average expectation that is frequently quoted in the SARB's MPC statements. The 'average' consists of the expectations of financial analysts, business executives and trade unions.

Table 2.1: Phrasing of the household inflation expectation question in selected countries

Country/region	Institution	Question	Justification for survey wording
Canada	Bank of Canada	What do you think the rate of inflation/deflation will be over the next 12 months?	Based on the New York Federal Reserve Bank survey; seen as 'cutting edge in survey design'.
Europe (done in a number of countries)	European Commission	Qualitative: By comparison with the past 12 months, how do you expect that consumer prices will develop in the next 12 months? The following options are provided: Increase more rapidly, increase at the same rate, increase at a slower rate, stay about the same, fall, don't know. Quantitative: By how much percent do you expect consumer prices to go up/down in the next 12 months? (Please give a single figure estimate): Consumer prices will increase by….% / decrease by…..%	
UK	Bank of England/TNS	How much would you expect prices in the shops generally to change over the next twelve months?	
Australia	Melbourne Institute of Applied Economic and Social Research	Qualitative: Thinking about the prices of things you buy, by this time next year, do you think they'll have gone up or down? Quantitative: By what percentage do you think prices will have gone up/down by this time next year?	Decided against using 'inflation' in the survey question because it could mean different things to different people. In some cases, the term may not be familiar to an individual.
Japan	Bank of Japan	Qualitative: What is your outlook for prices of overall goods and services you purchase one year from now? Quantitative: By what percent do you think prices will change one year from now?	

Country/region	Institution	Question	Justification for survey wording
New Zealand	Reserve Bank/UMR Research	Qualitative: In 12 months' time, do you expect the inflation figure to be higher, lower or the same? Quantitative: What do you think the actual (inflation) figure will be in 12 months' time?	The questions are only asked to respondents who are able to define the term 'inflation'. Before the expectation questions, respondents are asked: 'What is your understanding of the term inflation?' At this stage, respondents who respond with 'unsure' or 'no comment' are filtered out from the remaining inflation expectation questions. So at this stage of filtering, respondents are allowed to continue with the survey if they provide any response which is not 'unsure' or 'no comment'. In the second stage of filtering, all the comments made by respondents who have said something about their understanding of inflation are scrutinised. Respondents whose comments are irrelevant to the question are then filtered out again.
Sweden	National Institute of Economic Research	Qualitative: Compared to the situation today, do you think that in the next 12 months prices in general will… increase faster, increase at same rate, increase at slower rate, stay same, fall, don't know Quantitative: By how much percent do you think prices will rise/fall (i.e. what the rate of inflation/deflation will be) over the next 12 months?	
India	Reserve Bank of India	Qualitative: What is your expectation for general prices in the next year? Increase more than current rate, similar, less, no change, decline Quantitative: Inflation (defined as annual rate of the price change) rate after one year. Number of options, stretching from <1% to >16%	

Country/region	Institution	Question	Justification for survey wording
Indonesia	Bank of Indonesia	What do you expect on prices for goods/services in general for the next 6 months compared to today? Increase (give %), remain unchanged, decrease (give %)	
US	University of Michigan	Qualitative: During the next 12 months, do you think that prices in general will go up, or go down, or stay where they are now? Quantitative: By about what percent do you expect prices to go (up/down) on the average, during the next 12 months?	Curtin (2017): 'We devised ways to ask questions using the terms most understood by most people. When we use the economist jargon, a few understand but many simple say they don't know. The true test of wording is how well the results line up with the actual subsequent data.'
US	Conference Board	By how much do you expect prices in general to rise in 2018?	
US	New York Federal Reserve Bank	What do you expect the rate of inflation/deflation to be over the next 12 months?	Informed by research done by Bruine de Bruin et al. (2010) that found asking directly about inflation as opposed to 'prices in general' led to less respondent confusion on what was actually meant by the question.
SA	Bureau for Economic Research	Over the past five years, prices increased by on average 5.4 per cent per year. During 2016, prices increased by 6.3 per cent. By about how much do you expect prices in general to increase during the next 12 months?	Informed by the Michigan survey. Kershoff (2000) argues that it was not feasible to ask households directly what they expected inflation would be in future, as too few respondents would understand what was meant by inflation. When the BER survey was started, CPIX (headline CPI excluding mortgage costs) was the SARB's target inflation measure. It was argued that this would be a difficult concept for the general public to grasp.

Sources: Central bank websites, personal correspondence (2017)

2.5.3 The role of an 'anchor' number in expectations

To assist households to answer the question about prices in SA, the BER inflation survey question provides respondents with the average CPI inflation rate of the previous five years and the previous calendar year. Kershoff (2000) explains that the historic information about inflation was included after the BER's first trial run with measuring household inflation expectations in 2000. Initially, the BER did not provide the historic inflation data. This resulted in a very high average inflation expectation of 22% against actual CPI inflation that only increased by around 5% in 1999 and 2000. In a second trial run, the actual inflation figure for the previous five years and previous calendar year was provided. The result was a much lower average inflation expectation that was closer to the actual outcome. Importantly, the results of the two trial runs are not strictly comparable, as in the second trial run all responses above 25% were excluded. This was not the case in the first trial run.

While it is not common practice to provide historic inflation data to survey respondents[16], international evidence does suggest that perceptions about the most recent (historic) inflation trends play an important part in forming household expectations about inflation in future. A Bank of England/ GfK NOP survey done in 2010 found that eight out of every ten respondents in the UK said that past changes in prices were 'very important' or 'fairly important' in determining their near-term inflation expectations. These results have been consistent over time. In the Bank of England's 2016Q1 household survey, a third of households reported that price changes over the past twelve months were an important factor in determining their one-year ahead inflation expectation (Rowe, 2016:84)[17]. Cavallo, Crucas and Perez-Truglia (2014) came to a similar conclusion when studying inflation expectations in the US and Argentina. For Japan, Nishiguchi, Nakajima and Imakubo (2014) found that households formed inflation expectations by taking their personal inflation experience into account.

In support of the BER's methodology to provide the historic data, Biau et al. (2010) argue that disagreement about the interpretation of the inflation survey question may be reduced if respondents are informed of the latest official inflation estimate, the central's bank inflation target and/or the official definition of price stability. Coibion, Gorodnichenko and Kumar (2015) found that when presented with the Reserve Bank of New Zealand's inflation target, managers of firms in New Zealand revised their inflation forecasts significantly towards the stated target. This was especially the case for those managers who were initially very uncertain about their forecasts for inflation. Other studies (see Carroll, 2003:278; Garling & Gamble, 2008:404)

[16] In some inflation expectations surveys such as the one done by the Bank of England, respondents are asked about how they think prices have changed over the past 12 months.
[17] It was found that forward-looking indicators, including the expected strength of the UK economy, played a somewhat greater role in influencing longer-term UK inflation expectations.

show that past and recent inflation outcomes prove to be reliable predictors of expected future inflation.

In a recent paper, Cecchetti, Feroli, Hooper, Kashyap and Schoenholtz (2017) discussed the behaviour of US inflation since 1984. They found that whereas inflation expectations could be an important predictor of future inflation during a period of fast-rising or elevated inflation, the predictive power was lost when inflation was low and stable, as has been the case in the US over the past 30 years[18]. According to this analysis, the change in US inflation over recent decades is best predicted by a statistical model that only includes information from the preceding two quarters, and that inflation in the US fluctuates around a slowly changing trend. The authors refer to this trend as the local mean of inflation. In other words, when trying to predict inflation, a form of adaptive expectations appears to provide valuable information (Cecchetti et al., 2017:5).

Although the literature suggests that historical or recent inflation trends matter for expectations, the role of an anchor number in inflation expectations surveys has not received much attention in the literature. However, the use of an anchor number may bias expectations. To the extent that the general public (the population) does not have access to the anchor, the inflation expectation of the survey respondents (sample) may not be a true reflection of the public's expectation. This is in line with work done by Tversky and Kahneman (1974:1128), who show how different starting points to a question yield different estimates and, importantly, that these estimates are biased towards the initial (anchor) values. Bartiloro, Bottone and Rosolia (2017) show that almost half of the dispersion of firms' inflation expectations in Italy can be explained by varying information about the most recent inflation developments. Of the inflation expectation surveys analysed for this thesis, the Bank of Italy survey of firms' expectations and the BER survey are the only ones that provide respondents with information on historic inflation.

The role of an anchor number in the SA household inflation expectations survey is analysed in more detail in chapters 4 and 5.

2.5.4 Critique against the use of 'prices in general'

The University of Michigan has faced critique[19] on the long-standing wording of the questionnaire it uses to conduct household inflation expectations surveys. In particular, the

[18] In the case of New Zealand, Karagedikli and McDermott (2016) found that inflation expectations have become more backward-looking in recent years. In their view, this helps to explain the persistently low recent inflation prints in New Zealand.

[19] One of the limitations of the Michigan survey highlighted by Bruine de Bruin, Potter, Rich, Topa and Van der Klaauw (2010) is that households are only asked to provide a point forecast. The critique is that consumer behaviour is not only influenced by their expectations of future inflation, but also by uncertainty about future inflation. Point forecasts do not provide a measure of uncertainty. A suggestion is that inflation expectations surveys ask consumers to assign probabilities to a range of possible inflation outcomes. This specific critique falls beyond the scope of this study and is not investigated for SA.

concern is that the wording of the survey questions can be interpreted in a variety of ways and contributes to results that are not a true reflection of the public's inflation expectations (Bruine de Bruin et al., 2010).

In order to investigate this, the New York and Cleveland federal reserve banks, along with psychologists from Carnegie Mellon University who specialise in behavioural decision making, initiated the Household Inflation Expectations Project in late 2006. The project had a number of objectives, including to improve the measurement of household inflation expectations in the US. Another aim was to improve the understanding of how consumers form and update their inflation expectations (Van der Klaauw et al., 2008:5).

In a first step, the researchers evaluated the monthly household inflation expectations survey conducted by the University of Michigan. To their best knowledge at the time, the Michigan survey had not previously been systematically validated in terms of how it was interpreted by households, how these interpretations affected the responses and to what extent the responses correlated to subsequent behaviour (Van der Klaauw et al., 2008:4). Secondly, they developed a separate survey of household expectations with alternative question wording to the University of Michigan. Van der Klaauw et al. (2008) wanted to gauge the public's response to an alternative set of questions about household inflation expectations. They conducted 30 in-depth open-ended interviews of consumers. Respondents were asked to answer both the qualitative and quantitative survey questions of the University of Michigan about their expectation for prices in general. In addition, respondents had to define the concept of 'inflation' and answer a question about their expectation for the 'rate of inflation'.

The content analysis of the interviews found that respondents had a variety of interpretations of the qualitative inflation expectation question used in the Michigan survey. When asked the Michigan question about prices in general, almost half (47%) of the respondents referred to a relative price such as petrol. Less than 40% (38%) mentioned the general inflation rate. Van der Klaauw et al. (2008:16) argued that this suggests during times when relative prices are rising at a faster or slower pace than overall inflation, respondents may be biased to give higher or lower responses than those respondents who interpret 'prices in general' as the overall inflation rate for the country.

In contrast, all respondents indicated that they had heard of the term 'inflation' and 97% were able to provide a definition of inflation. In response to a question that asked directly about inflation, 'What do you think the rate of inflation will be…', respondents tended to focus on the prices of items that US consumers pay for in general. This is closer to the official definition of inflation. There was also more agreement amongst respondents on the outlook for US inflation than when answering the Michigan question about prices in general. When asked about their expectations for the rate of inflation, the majority of respondents (67%) talked about the trend

for overall prices in the economy (i.e. inflation) with no-one discussing a relative price such as for petrol. In the case of the prices-in-general question, answers were more likely to reflect the composition of individual consumers' consumption baskets. The result is that the prices-in-general question results in more disagreement or dispersion[20] in forecasts across respondents.

Other research reached a similar conclusion. When comparing the results of the Michigan survey with the Livingston survey of professional forecasters[21], Batchelor and Dua (1989) found greater dispersion in household forecasts than in the case of the professionals'. It has to be noted that this is not necessarily unique to the Michigan survey. Ranyard et al. (2008) and Armantier, Bruine de Bruin, Topa, Klaauw and Zafar (2013) show that across a number of surveys, individual household inflation expectations tend to be significantly more heterogeneous than in the case of professional forecasters' expectations.

Aside from the wording of the survey question, Cavallo et al. (2016) point to two main explanations for the wider dispersion of inflation expectations generally found in household inflation expectations surveys. Firstly, this has been attributed to rational inattention (see, for example, Sims, 2003), which refers to the reality that some individuals only partly acquire information on topics such as inflation because sourcing the information is costly. This is especially the case when the cost of sourcing the information is high compared to the potential gain from using the acquired information. This may be particularly relevant in a low-inflation country such as the US. In countries with low inflation, the potential cost of ignoring inflation is likely to be negligible. Bruine de Bruin et al. (2010) argue that individual inflation expectations are often informed by personal experiences, which can be diverse and inaccurate at times. This provides another reason why inflation expectations may differ sharply between individual households or consumers.

Notwithstanding these caveats, Van der Klaauw et al. (2008) found that a household inflation expectations question phrased around the 'rate of inflation' as opposed to 'prices in general' was less prone to diverse interpretation. Questions about inflation led to both lower levels of reported inflation and less disagreement among respondents about what they were actually asked to provide a forecast for. Because 'rate of inflation' seems to be a more precisely understood concept than 'prices in general', relative to what is intended to be measured, it

[20] Kamada et al. (2015) make an important distinction between short- and long-term expectations. Because of differences in household lifestyles, information-processing ability, etc. there are likely to be a larger dispersion in short-run inflation expectations. This will especially be the case if there is a sudden deviation of the actual inflation rate from the stated target. Long-term expectations should be much more immune to actual inflation developments, if inflation expectations are well anchored.

[21] The Livingston survey was started in 1946 by the late columnist Joseph Livingston. It is the oldest continuous survey of economists' expectations in the US and summarises the forecasts of economists from business, government, banking, and academia. The Federal Reserve Bank of Philadelphia took over responsibility for the survey in 1990.

results in responses that can be more easily compared to actual inflation measures[22] (Van der Klaauw et al., 2008).

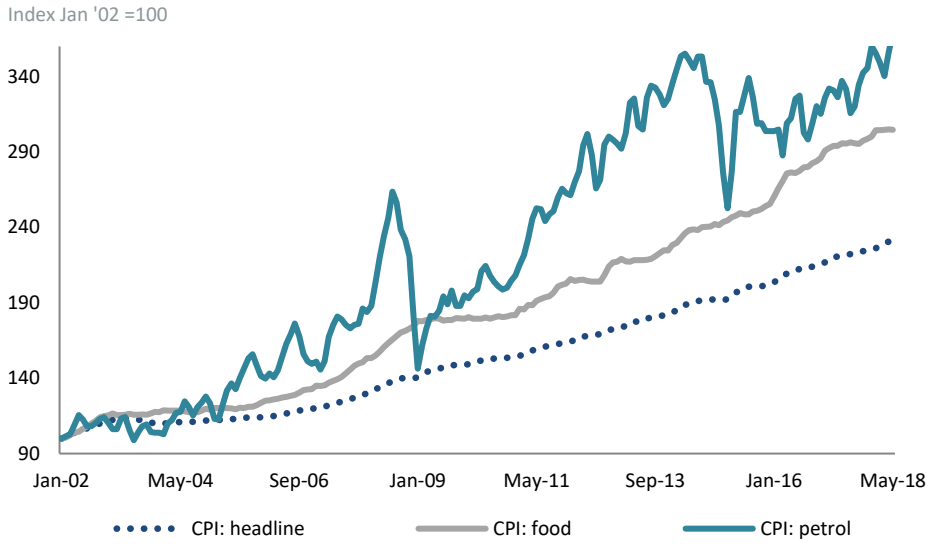
As in the case of the BER questionnaire, a feature of inflation expectations surveys is that they use simplified wording in the questions. Research by Schwarz (1999) and later Bruine de Bruin et al. (2010) found that simple wording provided no guarantee that a given sample of respondents would interpret a question in the same way. Furthermore, citing evidence of research done in Australia and Israel, Ranyard et al. (2008) concluded that the general public had some basic knowledge of inflation that should have enabled them to answer survey questions that ask directly about inflation.

Van der Klaauw et al. (2008) indicate that the correct measurement of expectations require respondents to agree with one another and with the compilers of the survey on exactly what the survey question is about. They argue that the excessive expectations (higher than the actual outcomes) found in some survey-based measures of expectations may be as a result of a different inflation concept being used by respondents than the actual inflation measure that their expectations are compared to. Furthermore, some of the heterogeneity in the interpretation of the expectations question may not be due to differences in beliefs about future inflation, but rather in how respondents define the question that is being asked (Van der Klaauw et al., 2008:17).

In this case, framing the question more simply in terms of prices in general may result in respondents potentially thinking more about relative price changes, especially for those goods that they purchase regularly. This is in contrast to answering a question about the general price level, i.e. inflation. Respondents may also focus on the prices of goods that are increasing as opposed to declining. This may be the case especially for products that are purchased regularly (Bruine de Bruin et al., 2010:2). One of the implications is that respondents who answer the prices-in-general question may provide expectations that seem relatively extreme compared to the headline CPI. This is likely to be particularly relevant in a country such as SA where food and petrol prices tend to increase at a faster pace than overall inflation. Figure 2.4 plots the rise in the headline CPI in SA against the rise in the food and petrol indices of the CPI. Since 2002, food and petrol prices have increased at a much faster rate than the overall headline CPI.

[22] At the time, the authors argued that more research was needed to gauge how the responses to the different questions predicted the consumption behaviour of the respondents.

Figure 2.4: Headline CPI versus food and petrol indices



Sources: Statistics South Africa, own calculations

After the results of the telephonic interviews were interpreted, the New York Federal Reserve Bank ran its own survey in which questions were asked about 'the rate of inflation' and 'the prices of goods you usually spend money on'. The sample of this survey consisted of consumers who had taken part in the Michigan survey (about 500) and also agreed to participate in further surveys after they had completed the Michigan questionnaire.

The results of the 30 in-depth interviews and the New York Federal Reserve Bank's more representative survey were compared with the results of the Michigan survey. It was found that when the questionnaire defined 'inflation' by referring to 'prices in general', there was more confusion (reflected in the wide dispersion of responses) than when simply phrasing the question as the expectation for inflation. This was especially the case with less educated respondents. A similar conclusion was reached when Bruine de Bruin, Van der Klaauw, Van Rooij, Teppa and De Vos (2016) conducted a comparable study in the Netherlands by making use of a Dutch national sample. Among other findings, the research in the Netherlands – done through web-based interviews – found a greater dispersion in inflation expectations when the question about 'prices in general' was asked as opposed to a question about 'inflation'. Biau et al. (2010) had similar results when analysing the question used by the European Commission in its monthly household inflation expectations survey. This survey is conducted in a number of European Union member states. The question is: 'By how much percent do you think that consumer prices have gone up/down over the past 12 months?' The vagueness of the question implies that respondents are forced to make their own interpretation as to what basket of goods to consider. Respondents 'may interpret the question as being about the

goods they purchase more frequently, a mix of goods and services, or some measure of the cost of living more generally' (Biau et al., 2010:6).

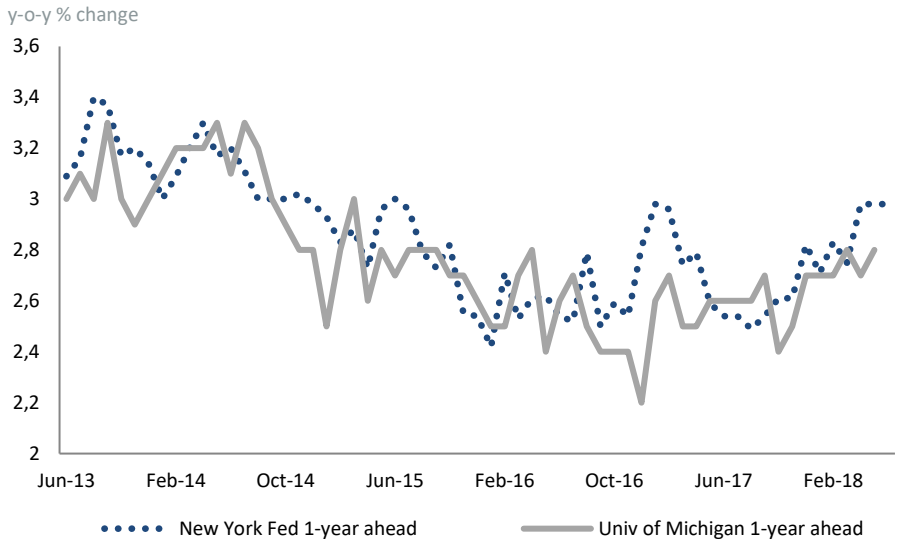
Bryan et al. (2015) is also critical of the use of 'prices in general' in the Michigan survey. The Federal Reserve Bank of Atlanta surveys business expectations through a survey called the Business Inflation Expectations Survey (BIE). This is a monthly online panel survey of more than 400 CEOs, chief financial officers and business owners. Respondents are asked to predict changes in their unit costs. In the September 2014 survey, the Atlanta Fed ran an experiment in which the BIE panel was asked the University of Michigan's prices-in-general question as opposed to the question usually asked about unit costs. In a further experiment, in the October 2014 survey, the BIE respondents were asked the question that the Philadelphia Federal Reserve Bank asks their panel of professional forecasters, namely by how much do they expect the US core consumer price index to increase over the next twelve months. The results showed that the average response to the 'rather vague concept' of 'prices in general' was a prediction that was much higher than the observed inflation trend. There was an exceptionally high heterogeneity (disagreement) of responses to the prices-in-general question, much higher than in the case of the original BIE question or the Philadelphia Fed question on the expectation for the core consumer price index (Bryan et al., 2015:12).

As mentioned earlier, Bullard (2016) has also highlighted some of the limitations of the Michigan survey. He argues the following:

> 'As a predictor of inflation, this measure tends to overstate inflation. Over the past 10 years, for example, expected inflation one year ahead averaged more than 3 percent, while actual inflation ended up averaging less than 2 percent. The Michigan survey's results also tend to bounce around quite a bit with the price of gasoline. Because consumers usually go to the gas station, as well as the grocery store, on a weekly basis, changes in those prices strongly shape their inflation expectations. However, many other prices exist in the economy, perhaps making this particular way of looking at inflation expectations less useful.'

One of the spillovers of the New York Fed's research is that it has been publishing its own monthly US household inflation expectations survey since June 2013. Figure 2.5 plots the New York Fed's one-year ahead expectation against the University of Michigan's measure. In the five years that the New York Fed survey has been conducted, on average the difference in expectations compared to the Michigan survey has been negligible at 0.08% (2.85% versus 2.77%).

Figure 2.5: New York Fed and University of Michigan household inflation expectations



Sources: Federal Reserve Bank of New York, University of Michigan

2.6 SUMMARY

This chapter dealt with the theory and research that is relevant to this study. Amongst academics, there is general consensus that expectations of future inflation influence consumption and saving behaviour, and therefore the broader business cycle. On its own, this provides strong justification for the study of inflation expectations. In addition, a number of important theories in economics are based on an understanding of the role of expectations. While the academic theory about inflation expectations was developing, the practice of monetary policy was evolving (sometimes ahead of the theory) in acknowledgement of the role of expectations.

Inflation expectations are used extensively in practice to understand the macroeconomy and to implement monetary policy. Therefore, the correct measurement of household inflation expectations is important. A crucial measurement question is the wording used in household inflation expectations surveys. The University of Michigan's method of using the phrase 'prices in general' in its household inflation expectations survey has received some critique in the literature.

The critique is relevant to SA because the wording of the BER's quarterly household inflation expectations survey was strongly influenced by the Michigan survey. Therefore, it seems appropriate to test whether the critique against the Michigan survey question is also relevant for the BER survey. The next section provides a detailed explanation of the methodology used to test the validity, including the use of an anchor number, of the BER's household inflation expectations survey.

CHAPTER 3
METHODOLOGY

3.1 INTRODUCTION

This chapter explains the mixed methods approach used for this study, and the motivation for adopting this research paradigm. The mixed methods approach involves combining qualitative and quantitative methods in a deliberate manner. More detail is provided about the specific phases within the mixed methods framework followed in the study, outlining how the qualitative, building and quantitative phases were used to answer the research question outlined in Chapter 1. This chapter also provides a detailed discussion on the data collection in each phase.

3.2 AN EXPLORATORY, SEQUENTIAL MIXED METHODS APPROACH

The research done by Bruine de Bruin et al. (2010; 2016) had both a qualitative and a quantitative component. First, they conducted interviews to gather information on the public's beliefs about inflation. This was used to inform a survey similar to the monthly University of Michigan inflation expectations survey. The literature refers to such an approach as a mixed methods research design. Creswell (1999:455) defines a mixed methods study as one in which at least one qualitative and one quantitative method is used to collect, analyse and report findings. The findings from both the qualitative and quantitative approaches are incorporated into a single study. Along with quantitative and qualitative studies, mixed methods research is recognised as the third major research paradigm (Burke Johnson, Onwuegbuzie & Turner, 2007:112).

The mixed methods approach is often used in social science environments, most notably educational, behavioural and health care research. However, the evolution of mixed methods research started in psychology (Migiro & Magangi, 2010). Mixed methods research has a particular role in policy-based research that needs to meet high technical requirements, as well as be comprehensive and jargon-free (Creswell, 1999:1). As outlined in Chapter 2, inflation expectations play an important role in monetary policy implementation. As such, this study investigates a topic that has relevance to the policy arena. From this perspective, the use of a mixed methods approach is appropriate. Creswell (1999) argues that a mixed methods approach meets these criteria as it incorporates everyday, qualitative language, as well as quantitative, technical data. Furthermore, the approach allows the researcher to view the world through multiple lenses. As a result, the approach helps with the understanding of complex social phenomena as it integrates different methods. In policy research, the approach is better

able to respond to multiple stakeholders than a single method of research would necessarily be able to do (Creswell, 1999).

In later work, Creswell (2008) argued that a mixed methods approach is useful when a researcher first needs to gather more information about a specific topic before conducting quantitative research. This argument is relevant to this study as greater insight into the public's understanding of inflation was required before a quantitative survey could be put together. This insight was provided by conducting a small-sample qualitative survey.

Creswell (2008) provides a number of reasons for the use of a mixed methods approach in research, including:

- Quantitative or qualitative research may be insufficient on its own (the insufficient argument). A mixed methods approach provides the researcher with a qualitative narrative, as well as quantitative data.
- A mixed methods approach provides different 'pictures' (the multiple angles argument). In quantitative research, a specific hypothesis or research question is typically tested whereas qualitative research provides the opportunity to gain deeper insight into the complexity of a particular research question.
- More evidence is provided (the more-evidence-the-better argument). Put differently, the results from one method can be extended to another, extending the breath or range of the study. The use of mixed methods also enables triangulation (Migiro & Magangi, 2010). Triangulation refers to the use of different methods to collect data in order to gauge whether the interpretation of data collected through one method can be validated by another method. This can provide stronger evidence for a conclusion.
- A mixed methods approach provides a more realistic reflection of real life (the intuitive argument).

There are a number of ways in which a mixed methods study can be designed[23]. One such design (adopted in this study) is an exploratory, sequential approach. Here the purpose is to use research based on findings from only a few individuals (the first phase) in an exploratory fashion. These findings then influence the design of the quantitative, second phase. The second phase uses a larger sample to reach generalisable results (Creswell & Plano Clark, 2011).

An exploratory approach is relevant for this study as an initial (exploratory) insight derived from a small sample into the South African (SA) public's understanding of the inflation process was

[23] See Creswell and Plano Clark (2011) for an overview. For example, the qualitative and quantitative research or surveys can be conducted at the same time and the results computed concurrently. On the other hand, in the case of the participant-selection variant, priority is given to the second, qualitative phase instead of the initial quantitative phase. In other words, depending on the answers sought, the sequencing of the qualitative and quantitative phases of a mixed methods study may differ.

first required before alternative survey wording for the Bureau for Economic Research's (BER) household inflation expectations survey could be designed (the so-called building phase). Greater insight into the SA public's understanding of inflation is appropriate because the wording of the BER's household inflation expectation survey was influenced by indications that, in general, the public did not understand the term inflation. Given that this finding was based on research done in the late 1990s, the qualitative survey in this study provides an up to date assessment of the public's understanding of inflation. The process followed is in line with Bruine de Bruin et al. (2010; 2016). Once the information gathered from the qualitative survey was analysed, alternative questions for the BER's quantitative, representative survey were compiled. The responses to these questions, including alternative survey wording to the BER questionnaire, were tested in a large and representative quantitative survey (the final phase). The information-gathering part of a mixed methods study often takes the form of qualitative research, including methods such as one-on-one interviews or focus groups. In the quantitative section, the findings of the qualitative research can be generalised to the broader public. One way to do this is to use a representative, quantitative survey. The building phase is a deliberate attempt to link the qualitative and quantitative phases meaningfully.

In summary, the mixed methods approach focuses on the rigorous integration, or combining, of qualitative and quantitative research. In a sequential mixed methods approach as followed in this study, qualitative data is collected first. In the next step, the data is analysed. The initial exploratory analysis is used to inform the quantitative data collection and analysis. In this study, a mixed methods approach was followed to explore the SA public's understanding of the term inflation with the ultimate aim to re-evaluate the wording of the BER's household inflation expectations survey. The sequential design adopted in this study is summarised in Table 3.1.

Table 3.1: Sequential mixed methods design for this study

Phases	Procedure	Outcomes
1.) Qualitative data collection	Conduct semi-structured interviews with a small sample (27 people) of the general public.	Transcripts of the interviews.
2.) Qualitative data analysis	Analyse the transcripts through content analysis in order to understand how the public reasons about inflation. What does inflation mean to the public; what terminology do they use to express their beliefs?	Analyse if there are any themes from the interviews. What 'language' is used by the interviewees?
3.) Building phase – integrate between qualitative and quantitative surveys	Consider the current wording of the BER's household inflation expectations survey and propose alternative questions that will test the findings from the qualitative phase in a representative survey of the SA population.	Design variables (questions) to be used in the quantitative survey. Consult with experts from academia and the private sector in this regard.
4.) Quantitative data collection	Add questions to the wider questionnaire that professional survey firm AC Nielsen uses to conduct the BER's household inflation expectations survey. The survey has a representative sample of 2 500 households.	Representative data from the answers of the AC Nielsen survey.
5.) Quantitative data analysis	Use data exploration techniques (histograms, regression analysis) to analyse the output of the questions added to the existing survey.	Descriptive statistics, regression coefficients to suggest relationship between variables. For example, what are the key socio-economic drivers of inflation expectations?
6.) Interpretation	Implications of results, potentially also for the BER's survey design and monetary policy.	

Source: Creswell (2008), adapted

3.3 QUALITATIVE DATA COLLECTION

In the qualitative phase of the project, a small sample of the public were interviewed in order to get a sense of the terminology they use when speaking about inflation and how they understand specific inflation-related terms used by the interviewer. This was the first step in addressing the research questions of the study, i.e. to test the validity of the BER's household inflation expectation question. A better understanding of the public's perceptions of inflation would go some way to advance the survey wording of the BER's household inflation

expectations survey for SA. Ultimately, this could contribute to improving the validity of the BER survey results.

Firstly, a short questionnaire was complied, which can be found in Appendix 1. Before the interviews were conducted, the questionnaire was submitted to the Ethical Committee of Stellenbosch University for approval. It was made clear to the committee that the individual responses would be kept anonymous. The Committee was satisfied with the questionnaire and gave permission for the interviews to proceed.

The questionnaire was then used to guide semi-structured, one-on-one interviews with a sample of people from the general SA public. As per the conditions of the ethical clearance obtained from Stellenbosch University, all of the respondents agreed to be interviewed and that the interviews be recorded to allow for later transcribing. The respondents were assured that their answers would be treated anonymously. As soon as possible after each interview was concluded, the voice recording was replayed and each individually recorded interview was transcribed in full. Records were kept of both the recordings and the transcriptions.

A structured interview, such as those done by AC Nielsen, involves a precisely worded set of questions from which the interviewer is not permitted to divert. A semi-structured interview is more open and exploratory, which allows for new ideas to the brought up during the interview. The responses given to a specific question may then result in further probing to extract additional information. The one-on-one individual interviews were conducted by the researcher between May and August 2017.

The number of people interviewed in the qualitative phase was informed by the use of data saturation techniques. Although the concept is hotly debated (Mason, 2010), Fusch and Ness (2015) argue that data saturation is reached when sufficient new information has been obtained to replicate a study, and when it is no longer feasible to obtain further data, or insight, by increasing the sample size. The academic literature suggests that in qualitative research, it is possible to get reasonable results with surprisingly few respondents. Baker and Edwards (2012) recommend a sample size of between six and 12 to ensure depth and richness of data. This is corroborated by Guest, Bunce and Johnson (2006), who found that data saturation can occur within the first 12 interviews and that few new trends are likely to emerge after that. According to Creswell (2011), qualitative research typically involves studying only a few individuals. This is assuming that the group being studied is fairly homogeneous. More than 12 interviews may be required if the selected group is relatively heterogeneous (Guest et al., 2006:79). Given the heterogeneous SA population, it is reasonable that data saturation was only reached after 25 interviews were conducted for this study, i.e. significantly more interviews than what the literature suggests is necessary in qualitative research.

In quantitative work, the Organisation for Economic Cooperation and Development (2003:22) reports that in its member countries, a rule of thumb is that about 30 responses are sufficient 'to obtain an acceptable level of precision for each strata for which data are to be published'

The content and data saturation analysis of the qualitative interviews was done in conjunction with researchers at the Centre for Research on Evaluation, Science and Technology (CREST) of Stellenbosch University. While CREST was mainly responsible for the content analysis, it was a collaborative process with the researcher.

After the researcher had interviewed 25 respondents, the analysis done by CREST suggested that data saturation had been reached. This implies that, the addition of further interviewees was no longer delivering new information. Researchers at CREST judged that conducting further interviews was unlikely to provide additional information. In total, 27 interviews were conducted and analysed for this study. This is in line with the 30 qualitative interviews conducted by Bruine de Bruin et al. (2010) in their work on the University of Michigan's household inflation expectation survey.

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3.3.1 The qualitative survey in more detail

The questions asked in the qualitative interviews conducted for this thesis were influenced by the research by Van der Klaauw et al. (2008) and Bruine de Bruin et al. (2010) for the United States (US). The South African context was also considered, including the need for questions that would be easily understood. The US research team carried out 30 in-depth, open-ended telephonic interviews with US consumers in the qualitative part of a study to gather information on the US public's understanding of inflation. Amongst other factors, the questions probed how the respondents interpreted the household inflation expectations questions asked in the monthly survey done by the University of Michigan. Given that the BER's household inflation expectations survey question is based on the University of Michigan survey, it made sense to use similar questions in the qualitative interviews for this study. In addition, the interview questions were designed to facilitate understanding by avoiding economic jargon.

Following a similar motivation, Kershoff (2000) justifies the BER's decision to use the phrase 'prices in general' (instead of asking directly about a household's expectation for inflation) in the BER's inflation expectations survey by citing concerns relating to the public's understanding of the term inflation. However, the BER has not before explicitly tested the public's understanding of the term inflation. Curtin (2017) provides a similar justification for the wording of the Michigan survey, arguing that when the University of Michigan used economic jargon (i.e. inflation) in survey questions, a few of the respondents understood the term, but many simply said that they did not know.

As outlined in Chapter 2, this justification has been questioned by Van der Klaauw et al. (2008), Bruine de Bruin et al. (2010) and Bryan et al. (2015), who found that the use of 'prices in general' in surveys led to more confusion among the general public than when asking a question about inflation directly. The qualitative questionnaire (interviews) in this thesis provides the starting point for a re-evaluation of the merit of the BER's concern relating to the SA public's understanding of the term inflation.

The interview questions began by trying to gauge the extent to which (if at all) the South African public had heard of the term inflation. After this was established, respondents were asked to, in their own words, define inflation. Later, respondents' understanding of the term 'prices in general' were also probed. This was done to establish whether the public had more than a superficial understanding of 'inflation' and 'prices in general'. The final set of questions were used to determine the public's perception of what the trend for inflation had been in the recent past. Respondents were also probed about their expectation for the future rise in inflation and prices in general. Appendix 1 provides the full list of questions used in the qualitative interviews. These questions were partly designed to encourage respondents to create a narrative. By using broad questions, the idea was to make people speak openly in a natural way about inflation without being led by overly structured questions.

In terms of demographics and sampling, the results of the qualitative interviews are not necessarily representative of the wider SA population, although a deliberate attempt was made to interview people from a wide range of backgrounds. The decision was made to exclude financial experts from the qualitative survey. The aim was to gauge the perceptions of the non-specialist general public as these respondents would be more representative of the typical SA household. To take this argument further, it was felt that non-specialist interviewees would be more representative of the typical respondent most likely to form part of the BER's household inflation expectations survey and therefore influence the survey results[24]. The respondents of the small-sample were from a variety of socio economic strata, with about half of the sample falling within the low-income category (see Table 3.2). This would typically involve people that were either a domestic worker, gardener, informal trader or petrol attendant. The household income benchmarks used by the BER in their quarterly consumer confidence survey were informally employed to classify the respondents into different income groups. Although respondents were not asked about their level of individual or household income, the likely income levels were deduced from the respondent's stated occupation. Respondents with a household income of R1-R2999 were classified as low income, while household income of

[24] The opinions of financial analysts are surveyed in a separate BER inflation expectations survey.

R14000 and higher were captured as high income. People of different age groups and occupations were interviewed.

Instead of being generalisable to the entire population, the interviews were exploratory and designed to probe the respondents in depth. Based on the insight that this provided, the later phase of the mixed methods approach was to design a set of quantitative questions for a much larger (and representative) sample of the SA population. These questions were asked as part of the regular monthly survey of SA households conducted by AC Nielsen on behalf of the BER.

Table 3.2: Demographics of qualitative interview respondents

Respondent	Race	Sex	Likely income[25]
1	African	F	Low
2	Coloured	M	Low
3	African	F	Low
4	African	M	Low
5	White	F	High
6	White	M	High
7	White	F	High
8	White	F	High
9	African	M	Low
10	Coloured	F	Low
11	White	M	High
12	Coloured	M	Middle
13	Coloured	F	Low
14	Coloured	F	Middle
15	White	F	High
16	White	F	Middle
17	African	M	Low
18	African	M	Low
19	African	M	Low
20	Coloured	F	Low
21	Coloured	M	Middle
22	White	F	High
23	Coloured	F	Low
24	Coloured	F	Middle
25	African	F	Low
26	White	F	High
27	Coloured	F	Low

Source: Own research. Qualitative survey, May-August 2017

3.4 THE BUILDING PHASE

In between the qualitative and quantitative phases of a sequential mixed methods approach to research, there is an important step that links the two research paradigms. This is referred to as the buidling phase and is where the integration takes place. It is the process where the results from the qualitative phase informs the approach taken in data collection of the quantitative phase. Importantly, the one phase builds on the work completed in the previous

[25] Respondents were not asked to provide their income level. This was derived from their stated occupations.

phase (Fetters, Curry & Creswell, 2013). The information gathered in the qualitative phase is used to develop an instrument (in this case, a questionnaire). The instrument (questionnaire) is then used in the subsequent phase of quantitative data collection. In this thesis, and as outlined in Table 3.1, the questions included in the quantitative survey were informed by the transcribed narrative that was compiled and collected in the previous (qualitative) phase.

The building phase included a session where the results of the qualitative interviews were presented to a group of experts from the Department of Economics at Stellenbosch University, the BER and the private sector. Questions to be included in the AC Nielsen survey were presented and debated. Some of the expert feedback highlighted the importance of including the word 'increase' in questions relating to 'prices in general'. This is a good example of the value of the mixed methods approach as it provides different perspectives on a specific topic, as well as some opportunity for feedback (Creswell, 2008). In this case, the feedback from experts after the qualitative data collection phase proved most valuable in the design of the quantitative interview questions of the mixed methods approach.

3.5 QUANTITATIVE DATA COLLECTION

The next step was to design questions for inclusion in the demographically representative, quantitative monthly survey done by AC Nielsen, a Johannesburg-based firm that specialises in market research. According to AC Nielsen (2018), the Omnibus Survey covers a scientifically drawn, representative sample of adults 15 years and older that live in urban areas nationwide. A probability sample of 2 500 households are selected using Nielsen's computerised household register of close to six million actual addresses in urban areas, and from maps for rural sampling. The sample is stratified by race, and within race, as well as by community size within a specific region. The Omnibus sample includes South African citizens only and excludes mine workers living in hostels, live-in domestic workers and individuals who are institutionalised. The sample is post-weighted to reflect estimated population in thousands. Weighting is done by province, community size, gender, and age. All metropolitan areas and urban communities with a total population of 100 000 or more are automatically included in the sample. A more detailed and technical description of AC Nielsen's survey method, including the survey population and type of sampling, is provided in Appendix 3. The use of the AC Nielsen survey enabled results that are generalisable to the broader SA population. The survey that included questions designed for this research was conducted in October 2017.

Upon the completion of the survey, AC Nielsen compiled summary statistics, including the mean and standard deviations of the different questions. These results were emailed in an Microsoft excel format to the author of this thesis. The individual responses of each of the

2 500 respondents were also requested by the author. Again, these were emailed in a Microsoft excel format.

As part of the process to test the validity of the BER's household inflation expectations survey, the quantitative phase showed the extent to which households' 12-month expectations differ when they are asked to provide an expectation for inflation as opposed to a 12-month expectation for the increase in prices in general. Secondly, the quantitative survey was used to assess why household inflation expectations diverge when the survey question is phrased differently, i.e. can we conclude that this is because inflation and prices in general are understood differently by the South African public? The quantitative survey tested the qualitative finding that the public has a reasonable understanding of the term 'inflation' in a larger survey that is representative of the SA population and provides generalisable results. Besides the expert feedback received in the building phase, a number of logistical issues informed the choice of questions to be included in the AC Nielsen survey. The most important development was that due to uncertainty about whether the survey would be conducted in that month[26], the BER did not submit its usual prices-in-general questions for the October 2017 AC Nielsen Omnibus survey,

For the purposes of this study, it was fortunate that AC Nielsen was able to continue with the October 2017 survey. However, by the time the firm took the decision to go ahead with the survey, the BER had already contracted with another survey firm to conduct its 2017Q4 household inflation expectations survey. In order to enable the comparison between households' understanding of the word 'inflation' and the phrase 'prices in general', the BER's normal prices-in-general question, along with questions that directly asked respondents about their expectation for inflation, were included in the questionnaire submitted to AC Nielsen. The detailed list of questions that AC Nielsen used for the purposes of this research can be found in Appendix 2.

The absence of the BER's prices-in-general question did also offer the opportunity to test the impact of the inclusion of an anchor number, i.e. the historic inflation figures. This was achieved by asking the BER's prices-in-general question firstly without the anchor number and then asking the question including historic CPI inflation figures[27]. The rationale for including a question with and without the anchor was to be able to test the extent to which (if at all) the anchor number had an influence on the inflation expectations of respondents. The quantitative

[26] The Omnibus survey is made possible by a number of firms submitting (and paying for) questions on a range of topics to be surveyed by AC Nielsen. During times when the economy is slowing, as was the case in 2017, Nielsen struggles to receive sufficient questions to make it worthwhile to incur the cost of doing a survey every month.

[27] The option of first asking the prices-in-general question without an anchor number opened up when it became clear that the BER had decided to use a different market research firm to conduct its 2017Q4 household inflation expectations survey. This removed any concerns that the questions relevant to this study could influence responses to the BER questions.

survey provided a good opportunity to further explore the extent to which the provision of an anchor number determined the inflation expectations reported by survey respondents.

In line with the suggestion from the expert advice received in the building phase, and in order to prevent any confusion among respondents, the prices-in-general questions for the AC Nielsen quantitative survey asked about the expected '*increase* in prices in general'. The exact phrasing was as follows:

> *By about how much do you expect prices in general to increase during the next 12 months?*

This matches the wording used by the BER in its quarterly household inflation expectations survey, except that the anchor figure is omitted. In addition, to test the generalisability of the findings from the qualitative portion of the study, the definitional question of 'prices in general' that formed part of the qualitative interviews described earlier, was also included in this questionnaire.

In order to prevent the prices-in-general questions potentially influencing the answers of the inflation questions[28], the two sets of questions were separated. The first batch of questions (on 'prices in general') were presented to only half of the survey respondents, i.e. to roughly 1250 respondents. The other half of respondents were asked about their expectation for the rate of 'inflation', with and without an anchor number, as well as the definitional question on inflation. This choice was made in order to avoid the one set of questions affecting the respondents' answer to the second set of questions. The following question was asked to determine respondents' inflation expectations:

> *What do you expect the rate of inflation to be during the next 12 months?*

In summary, for the quantitative survey, one half of surveyed households were asked about their expectation for prices in general (first excluding and then including an anchor number) during the next 12 months and their understanding of 'prices in general'. The other half of households were asked questions about their expectation for 'inflation' (first excluding and then including an anchor number) over the same horizon, as well as a definitional question on inflation.

The next chapter discusses the results of, and provides descriptive statistics for, the qualitative interviews and the quantitative survey.

[28] This could happen for a number of reasons. For example, respondents may be confused about why they have to answer the same set of questions about 'prices in general' and 'inflation', especially if they (correctly) believe that the two concepts are the same. Respondents may feel that they are being tricked, resulting in the answers not necessarily reflecting their core beliefs.

CHAPTER 4
RESULTS: DATA ANALYSIS

4.1 INTRODUCTION

In this chapter, the results of the qualitative interviews and quantitative survey are presented. For the qualitative interviews, particular attention is given to how the public distinguishes between inflation and prices in general. The impact of the use of an anchor number is also analysed. This is followed by a discussion of the quantitative survey results. Descriptive statistics are used to analyse households' ability to define inflation and the extent to which their response is influenced by the anchor number. In addition, households' inflation expectations are considered across different socio-economic groups to see if they differ across these groups.

4.2 QUALITATIVE DATA ANALYSIS

Table 4.1 summarises the main findings of the qualitative interviews. The most prominent result was that a large majority of respondents had heard of the term inflation before. With the exception of two[29], all of the respondents said that they had heard of inflation in the past. Given that reporting on inflation trends is widespread across all forms of media, including social media, in SA and that the country does periodically experience generalised episodes of fast-rising prices (inflation[30]), this is an intuitive result.

Table 4.1: The public's understanding of 'inflation' versus 'prices in general'

Number of reasonable responses	Inflation	Prices in general
Heard about the concept	25/27	*
Provide definition in own words	11/27	7/27
Identify correct definition from 2 options	21/27	20/27

Note: * Respondents were not asked whether they had heard of 'prices in general', but were later probed to provide a definition of the term.
Source: Own research. Qualitative survey, May-August 2017

Whereas almost all of the respondents had heard of the term inflation, the results were less encouraging when respondents were asked to, in their own words and without any probing or assistance, provide a definition of inflation. In this case, fewer than half of the respondents

[29] Even in these two cases, it is not clear that the respondents have necessarily not heard of inflation. Language barriers may have been an important factor as their command of English was particularly poor.
[30] This is certainly true for relative prices such as food and transport costs in SA. These relative prices have been known to post double-digit increases, most recently when food prices increased by almost 11% year-on-year in 2016. In 2018, the more than R2/litre rise in the petrol price between March and July 2018 received a lot of media attention. In fact, President Cyril Ramaphosa tasked ministers in the economic cluster to suggest measures to alleviate the impact of higher fuel costs on consumers.

were able to provide a reasonable definition of inflation as outlined in any standard macroeconomic textbook (see, for example, Mohr, 2008a[31]). In terms of the public's definition of inflation, the answer had to include two important concepts. Firstly, the respondent had to at least have some comprehension that inflation referred to prices that were increasing or accelerating. Secondly, a respondent preferably had to mention that inflation was the rise in the prices of all goods and services in the economy[32], rather than referring to the rise in the price of a specific good or service such as food or taxi fares. In other words, the distinction between inflation and relative price rises is important here. This is particularly true in the context of SA monetary policy. The SA Reserve Bank (SARB) does not aim to control the rise in relative prices, but rather the overall pace of price rises in the economy as measured by the headline consumer price index (CPI) for all urban areas (Manuel, 2008:7).

In general, the content analysis of the qualitative interviews showed that the respondents appeared to understand that inflation referred to the rise in prices. Respondents made more mention of the rise in prices of goods as opposed to services, or they referred to inflation as the rise in the price of 'everything'. Many respondents referred to the prices of goods and services that they often personally had to purchase, mainly food items. As an example, below is the response from respondent 25 when asked to, in her own words, provide a definition of inflation:

> 'When the prices of everything goes up, such as petrol, the cost of living, rent and so forth.'

In terms of the words that the respondents most often used to describe inflation, 'prices' (eight times) came up the most, followed by the phrase 'up and down' (seven times) and the words 'expensive' (five), 'cost' (four) and 'money' (four). The phrase 'up and down' was often used when respondents spoke about the petrol price or the rand exchange rate. Of interest is that politics (used four times) is the factor that was most often mentioned as likely to drive inflation higher in future. The impact of the 2017 drought on future inflation was also mentioned on a number of occasions.

Other noteworthy results from the qualitative interviews include:

- The majority (18 out of 27) of respondents thought that inflation was high at the time of the interview (May to August 2017).
- Television and newspapers were the major sources of information about inflation for the respondents.

[31] Mohr simply defines inflation as a sustained increase in the general price level.
[32] The second criteria was not applied overly strictly. If a respondent mentioned that inflation referred to the rise in prices (plural) of goods or services (plural), it was deemed a reasonable answer. In other words, the respondent did not necessarily have to mention all goods and services in the definition, as long as he did not refer to inflation as the rise in the price of only one or two goods, in other words if he provided a definition of a relative price increase.

- A large majority (21 out of 27) of respondents believed that the rate of inflation would increase over the next 12 months, i.e. inflation would accelerate with goods and services becoming more expensive.

4.2.1 Distinguishing between 'inflation' and 'prices in general'

A greater number (11) of respondents were able to provide a reasonable definition of 'inflation' as opposed to giving a sound definition for 'prices in general' (seven). As with the first question on whether respondents had heard of inflation, this suggests that there may be a greater appreciation of the term inflation among the SA public than the BER assumed when the inflation expectations survey was launched in the early 2000s. These results correspond with the qualitative survey conducted by Bruine de Bruin et al. (2010) for the US, which also showed that US households had a greater understanding of inflation than prices in general.

However, there is an important caveat that was only considered towards the end of the qualitative interview process. Because inflation refers to the rate of increase in prices, in hindsight the phrasing of the prices-in-general questions may have led to some confusion. Respondents were simply asked what they understood of the term 'prices in general'. There may have been more correct responses had they been asked what their understanding was of the '*increase* in prices in general'. This was corrected in the fourth phase of the mixed methods approach, i.e. the quantitative data collection process conducted by AC Nielsen. In the fourth phase, respondents were asked about their expectation for the '*increase* in prices in general'. This experience highlights the value of the mixed methods approach. Although the researcher had become aware of the anomaly earlier, it was also pointed out by experts during the building phase. This prevented it from affecting the conclusions reached after the quantitative analysis.

The results of the inflation definition question improved dramatically when respondents were asked to pick the definition that corresponded the closest to their understanding of inflation from the following two options:

- Inflation refers to an increase in the price of a specific good or service such as food or taxi fares.
- Inflation refers to an increase in the price of all goods and services.

When provided with the option to choose between a relative price and inflation definition, a large majority (21 out of 27) of the respondents was able to pick the correct definition of inflation. To reiterate, less than half (41%) of respondents gave a satisfactory definition of inflation before being provided with a range of options. However, given the BER's scepticism of the public's understanding of inflation when the wording of the household inflation expectations survey was considered in the late 1990s and early 2000s, the fact that around

40% of respondents were able to provide a definition suggests that the public's knowledge of the (technical) term inflation may have been underestimated in the past. Alternatively, it could also be that the general public's knowledge of inflation has improved since the adoption of inflation targeting in SA during 2000.

Because the BER did not conduct a similar exercise as done here before starting the household inflation expectations survey, historic comparisons are almost impossible. However, it could be that increased access to technology such as smart phones and social media has enabled a much larger part of the SA population to engage with relatively complex terms that were previously only known to a smaller proportion of the population. It may also be that how inflation is generally defined has become more accessible to the public over time. This may especially be the case given that the SARB has actively used central bank communication since the introduction of inflation targeting in an attempt to improve transparency and to be more accountable to the public (Reid, 2011).

Bryan (1997) outlines how the definition of inflation has changed over the last century. He argues that inflation was initially used in relation to currencies, then to a condition of money (the monetarist approach) and today it is generally used to describe prices. Thinking about inflation in terms of price rises is arguably simpler than having to translate inflation into currency movements or the change in the money supply of a country.

When interview respondents were asked to pick a definition from a range of options that best described their understanding of 'prices in general', the number of respondents who picked the correct definition (it refers to a rise in the prices of all goods and services) was on par with when a similar question was asked for inflation. To reiterate, a larger proportion of respondents may have provided a correct initial 'prices in general' definition if they were probed about the *increase* in prices in general.

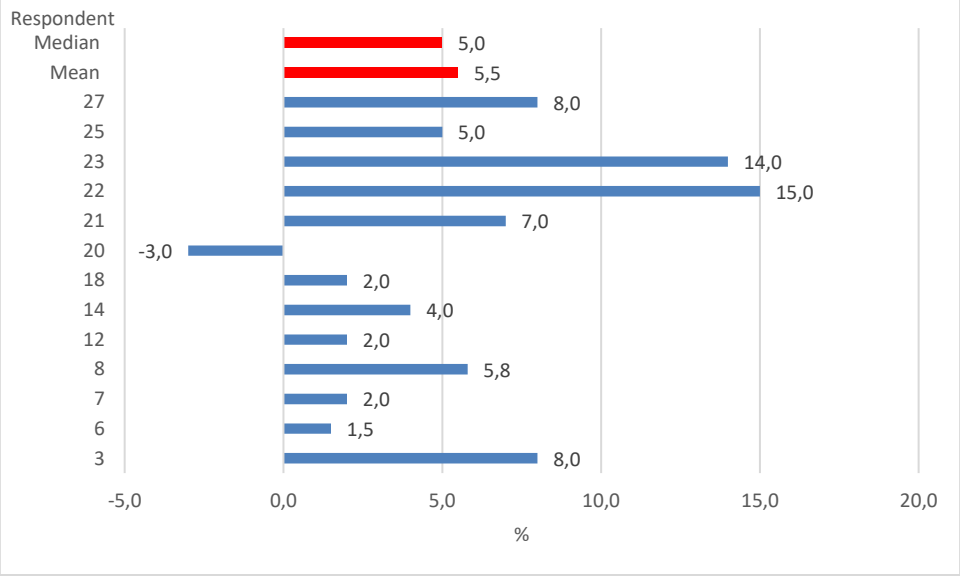
Nevertheless, the earlier conclusion by the BER that SA households understand the term 'prices in general' better than the term 'inflation' is not supported by the qualitative analysis. Of further interest was the mixed responses to the question about whether there was a difference between 'inflation' and 'prices in general'. Eleven respondents answered that they thought there was a difference, nine said there was not (the correct answer) and seven respondents were unsure. Unfortunately, the phrasing of the question may also have contributed to these results. Had the question been asked about the difference between 'inflation' and 'the *increase* in prices in general', the response may have been more definitive in either direction.

4.2.2 The use of an anchor number

In addition to probing how the public distinguishes between prices in general and inflation, the qualitative interviews explored how expectations are impacted when the public is provided with specific information on inflation. The BER is one of the few institutions that conducts household inflation expectations surveys which provide the respondents with the historical information on inflation, referred to as an anchor number. The question becomes to what extent the anchor number biases the results, in other words would a particular respondent have, for example, given a higher forecast for inflation if it was not for the anchor number?

The qualitative interviews tested this. First, respondents were asked about their expectation for inflation in 12 months' time. Thirteen respondents were confident enough to provide a forecast. Figure 4.1 plots the individual forecasts with the average expectation at 5.5%, i.e. within the SARB's 3 to 6% inflation target. There seemed to be some confusion as some respondents answered in terms of the increase in the level of inflation as opposed to what the rate of inflation would be in 12 months. In particular, respondent 6 referred to the increase in the level of inflation (for example from 6 to 7.5%[33]) when answering the question. This explains respondent 6's inflation expectation of 1.5%.

Figure 4.1: Twelve-month inflation expectations of the public



Source: Own research. Qualitative survey, May-August 2017

[33] This is another example of the value of a mixed methods approach as this misinterpretation of the question would almost certainly have been missed in a purely quantitative study.

The expectation question was followed up by providing the respondents with the latest historic inflation number, as well as the SARB's inflation target range. Cavallo et al. (2014), Coibion et al. (2015) and Rowe (2016) found that historic inflation trends are an important driver of inflation expectations. Armed with the information on past inflation and the SARB's target, the question was asked whether this changed the respondent's expectation for the future rise or decline in inflation.

The response was mixed. Of the 27 respondents, 11 said the additional information would change their forecast. Nine of these 11 respondents opted to revise their forecast lower after being provided with additional information on inflation. Four respondents said the anchor number did not change their outlook for inflation. Twelve respondents were not sure whether the anchor information would change their expectation for inflation. The next section of this study and Chapter 5 explore this topic in more detail.

In summary, the main finding of the qualitative interviews is that there is no clear evidence that 'inflation' is a less understood term than 'prices in general'. In fact, the qualitative interviews indicate that the term 'inflation' may be at least as well understood as 'prices in general', and that a large proportion (78%) of the small sample interviewed understood the term 'inflation' reasonably well. That is to say, they were able to pick the correct definition of inflation when provided with a list of options. Although the results are not as emphatic, this is in line with the findings of similar work by Bruine de Bruin et al. (2010; 2016) for the US and the Netherlands. Furthermore, the qualitative interviews suggest that a non-trivial (around 40%) proportion of the public changed their inflation expectation when provided with specific information about inflation (the latest figure and the SARB's target).

4.3 EXPLORATORY DATA ANALYSIS OF THE QUANTITATIVE SURVEY

The descriptive statistics of the survey data are summarised in Table 4.2. For each of the 2500 respondents, AC Nielsen attaches a sample weight. This sample weight captures the proportion of the total SA population that an individual with these particular socio-economic characteristics is thought to represent. The figures presented in Table 4.2 were calculated taking these weights into consideration.

In general, the quantitative survey confirmed many of the broad conclusions of the content analysis of the interviews from the qualitative phase of the study. In terms of the public's understanding of inflation, almost 70% of the respondents in the quantitative survey picked the correct definition of inflation. This was slightly more than the 65% of respondents who picked the correct definition of 'the increase in prices in general'. As with the qualitative interviews, these results do not support the narrative put forward by the University of Michigan and the

BER that 'prices in general' is a concept that is easier for the public to understand than 'inflation'. Instead, these results were aligned with the findings of the research done by Bruine de Bruin et al. (2010).

In terms of the comparison between the expectation for the increase in prices in general and the rate of inflation over the next 12 months, a striking feature of the AC Nielsen survey is how close the results across the different questions were. However, when the questions were asked without providing an anchor number, the 12-month ahead expectations of inflation were on average a percentage point lower (12.4% versus 13.4%) than the expectations of prices in general.

Table 4.2: Descriptive statistics from the quantitative survey

	Prices in general	Inflation
Expectation (excl. anchor)		
Mean	13.4	12.4
Median	7.0	7.0
Standard deviation	17.3	15.7
Expectation (with anchor)		
Mean	8.7*	8.6
Median	7.0	7.0
Standard deviation	8.8	9.3
Correct definition	**65%**	**68%**

Note: *This expectation is not directly comparable to the BER's 2017Q4 household inflation expectation figure of 6.2%. The BER excludes all expectations above 25%, which brings down the average.

Source: AC Nielsen Omnibus survey, October 2017

These expectations can be compared to the forecasts of the central bank and private sector experts. The SARB's 2018 (i.e. 12-month ahead) headline CPI inflation forecast was 5.2% in November 2017, when this survey was conducted (SARB, 2017). The inflation expectations (headline CPI) of financial experts for this period were far closer to the historical (anchor) figure. This is reflected in both the Reuters Econometer survey of November 2017, in which inflation of 5.2% was forecast for 2018, and the BER's 2017Q4 inflation expectations survey, in which financial analysts' CPI inflation expectation for 2018 was 5.1%. Therefore, the surveyed household expectations for this study were significantly higher than the view of the SARB and financial analysts at the same time. This is in line with the international evidence that household inflation expectations are normally higher than those of financial analysts who are better

informed of the latest inflation trends (Thomas & Grant, 2008). However, households' expectations for inflation were somewhat closer to the view of analysts' than the expectations (over the same horizon) for prices in general. Furthermore, although elevated and indicating a high degree of variation between the individual responses, the standard deviation of the inflation expectations (when an anchor was not provided) was somewhat lower than was the case for the prices in general expectation (see Table 4.3). In contrast, when an anchor was provided, the standard deviation was higher for the inflation question.

As outlined in Table 4.2, mean expectations were vastly different when respondents were provided with the historic inflation figure for the past five years (2012-2016) and for the most recent completed calendar year (2016 at that stage). This is in line with Cavallo et al. (2014), Coibion et al. (2015) and Rowe (2016) that show how historical inflation trends are important in influencing inflation expectations. Furthermore, it corresponds with work done by Tversky and Kahneman (1974:1128), who show how different starting points to a question yield different estimates and, importantly, that these estimates are biased towards the initial (anchor) values.

Relative to when an anchor number was not provided, the decline in expectations for inflation when the anchor was provided amounted to almost four percentage points. For the prices in general expectation, the divergence was even greater at almost five percentage points. In other words, when the anchor number was provided, expectations were significantly lower on average, and closer to both the historic inflation trends and the forecasts of financial analysts. Furthermore, the standard deviation was also a lot lower. However, both for prices in general and inflation, the median expectation did not change when an anchor was provided. So the respondents in the middle of the distribution of expectations were not affected by the provision of an anchor number. The mean and standard deviation changed significantly, implying that the anchor had an impact on the respondents who had the more extreme expectations when an anchor number was not provided.

Another feature worth highlighting is that once the same anchor number was provided, there is an economically insignificant difference (8.6% versus 8.7%) between respondents' expectations of inflation and prices in general. In that sense, one could argue that once SA households are presented with the historic inflation data, the way in which the question about expectations is phrased has at best only a modest impact on expectations[34]. The almost identical expectations when an anchor is provided raises questions about this feature of survey wording in SA household inflation expectations surveys. In the SA context, when an anchor is provided, the wording of the household inflation expectations survey does not seem to have

[34] This may not always hold, but was true for the single snapshot survey done for this study.

much influence on the inflation forecast of respondents. There is also relatively little difference between the standard deviations of the expectations of inflation and prices in general when an anchor number is provided.

However, it could be argued that the responses to the prices in general and inflation questions without the anchor number are a truer reflection of the SA public's expectations. In the absence of being provided with an anchor number, it is unclear that the population represented by the sample would know what the historic inflation rate was. It is not clear that the expectations of households when an anchor number is provided can, or should, be generalised to the entire population. Both the qualitative and quantitative work done for this study showed that the public was equally comfortable (or uncomfortable) answering a question on 'prices in general' and 'inflation', but that a large percentage did not understand either version of the question.

In summary, as was found in the qualitative work, the descriptive statistics of the quantitative survey data do not support the narrative that 'prices in general' is a term that the SA public more easily understands than 'inflation'. Indeed, a slightly greater share of respondents picked the correct definition of 'inflation' as opposed to the correct definition of 'prices in general'.

Furthermore, when an anchor number is not provided, household expectations for inflation are lower than when households are asked to provide an expectation for prices in general. Finally, when an anchor number is provided, the impact of survey wording in influencing household inflation expectations is negligible. This is true both for the actual level of expectations and for the standard deviation of responses. However, the inclusion of the anchor number has a sizeable effect on the mean and standard deviation of the expectations. The anchor number seems to have a notable effect on the respondents whose original expectations are furthest from the realistic figures.

4.3.1 The role of socio-economic factors in inflation expectations

Besides providing the aggregate inflation expectations figures, the AC Nielsen survey included a range of socio-economic characteristics – race, province, gender, income, education and age. Some of the notable demographic trends are presented graphically below[35] (figures 4.2 to 4.5). As with the descriptive statistics in Table 4.2, the data presented here has been adjusted for the sample weights. The figures below show the expectations for both prices in general and inflation along a range of socio-economic characteristics.

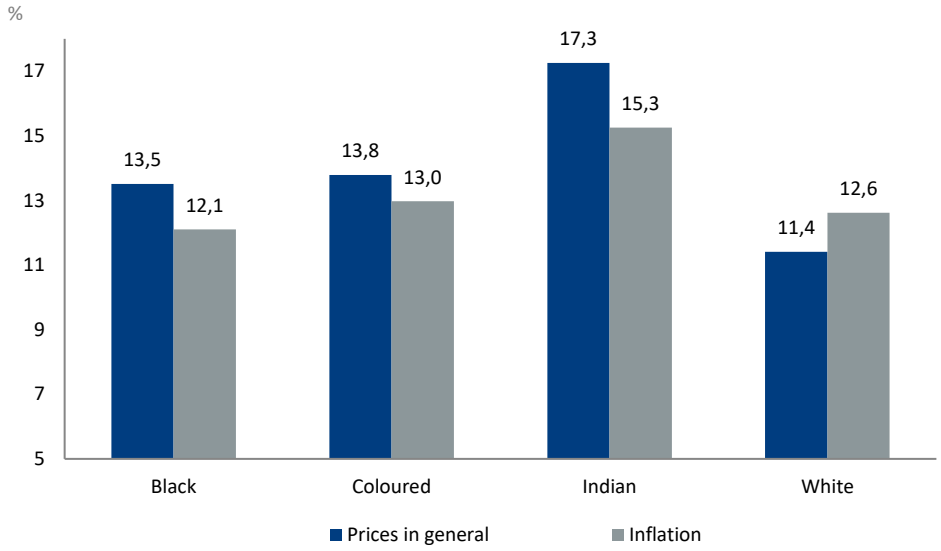
There are some notable differences in mean expectations between the different race groups. In the case of inflation, black households have the lowest expectations on average. Inflation

[35] The expectations presented in this section are for the first question that did not provide an anchor number.

expectations amongst coloured and white households are similar, with the expectation of coloured households only slightly higher than for whites. For prices in general, white households have the lowest expectations. Compared to the other race groups, Indian households have by far the highest expectations, both for inflation and prices in general. At more than 15% in October 2017, the 12-month ahead mean inflation expectation of Indian households were about triple the inflation expectation of the SARB and financial analysts at the time. The expectation of Indian households is even higher for prices in general. With the exception of white households, the other race groups all have higher expectations for prices in general than for inflation.

Besides the fact that these descriptive statistics present relationships that are unconditional[36], they also provide only a single snapshot, so these results should be treated with caution. In particular, the expectations of Indian respondents should be qualified. The median unanchored expectation of Indians is eight, i.e. in line with the median (seven) of the entire set of expectations. Of the 65 Indian households that answered the inflation expectations question, seven respondents had particularly extreme expectations. Indeed, the mean expectation of these seven respondents was 81% (median 88%). As is often the case, the mean (of all the responses) hides a lot of information. Even after being provided with an anchor number, the mean expectation of the seven 'extreme' Indian households remained very high at 62% (median 65%).

Figure 4.2: Expectations per race group

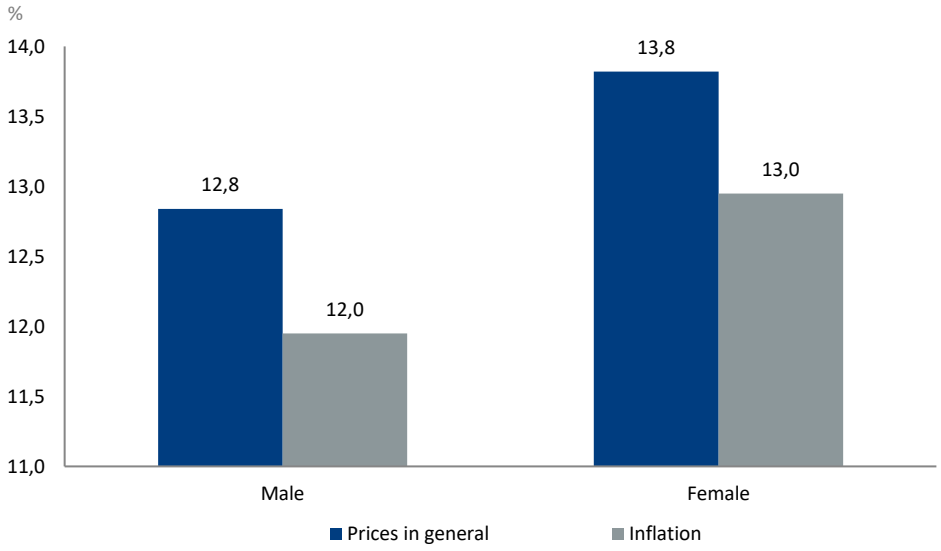


Source: AC Nielsen Omnibus survey, October 2017

[36] The descriptive statistics consider relationships without controlling for other socio-economic characteristics. A characteristic such as race may correlate with another characteristic that better explains expectations, but when race is considered independently, this variation in the expectations appear to be caused by the race characteristic alone.

In terms of gender, whether the expectation is for prices in general or inflation, women have higher expectations than men (Figure 4.3). This corresponds to the international experience (see, for example, Bryan & Venkatu, 2001a). A number of arguments have been put forward for this phenomenon, including that men (generally) earn more[37] and have higher levels of education than women. In general, expectations tend to be lower as educational and income levels rise (Bryan & Venkatu, 2001b). Another explanation suggested is that women do most of the grocery shopping in households, and that food price movements will have a greater impact on their expectations than in the case of men. To the extent that food prices increase at a faster rate than inflation (as is generally the case in SA), this may provide some explanation for the higher expectations of women. However, Bryan and Venkatu (2001b) show that even during periods in the US when food prices increased by less than a range of other items, inflation expectations of women remained higher than men's. They conclude that, while there is unequivocal evidence of higher inflation expectations among women, it is not entirely clear why this is so.

Figure 4.3: Expectations per gender



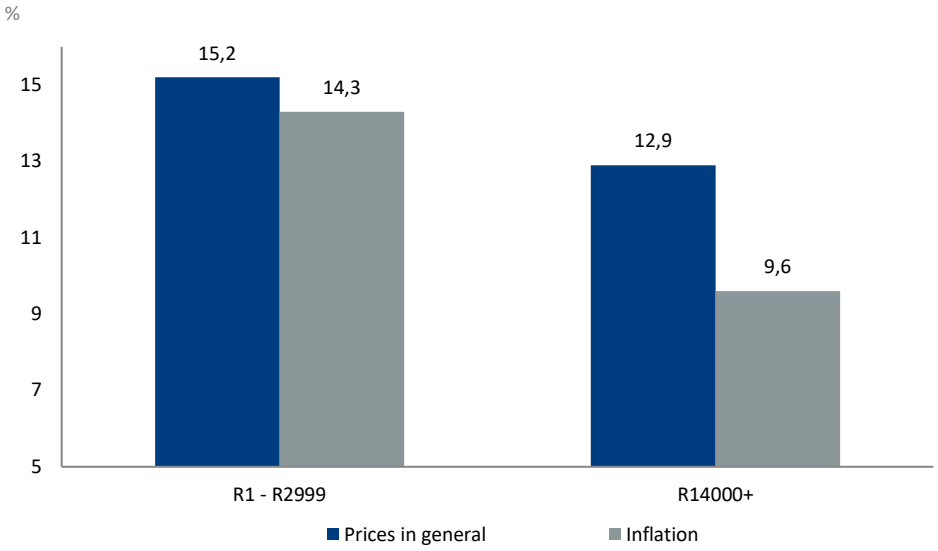
Source: AC Nielsen Omnibus survey, October 2017

As already mentioned, for the US, Bryan and Venkatu (2001a) find individuals with higher incomes generally have lower inflation expectations than low-income respondents. This is borne out in the SA data, as represented in Figure 4.4. For inflation, the expectation of low-

[37] The July 2018 PwC report on executive pay found that the median gap in the total guaranteed package (salary and stated benefits) between men and women working for SA-listed firms ranged from 5 to 10% in 2017 (PwC, 2018).

income respondents is almost five percentage points higher than in the case of high-income respondents, i.e. those earning more than R14 000 per month.

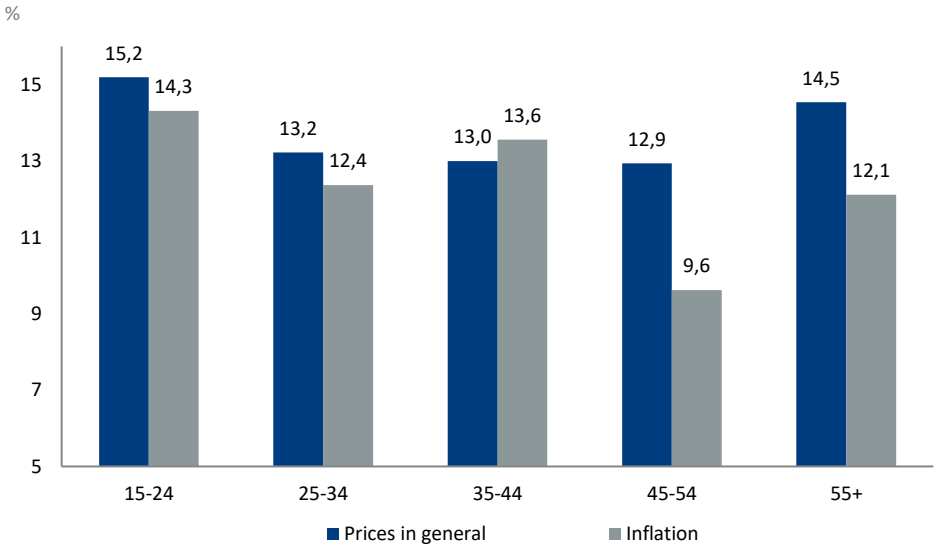
Figure 4.4: Expectations per income group



Source: AC Nielsen Omnibus survey, October 2017

While there were some mixed trends between the different age groups, the AC Nielsen survey results indicate that inflation expectations of younger respondents are higher than their middle-aged counterparts. Expectations rise again in the 55+ age category. Once again, this finding is in line with research done in the US (Bryan and Venkatu, 2001a). A possible reason for the difference in expectations between age groups is that exposure to past inflation episodes plays an important role in expectation formation (Reid, Siklos & Du Plessis, 2018).

Figure 4.5: Expectations per age group



Source: AC Nielsen Omnibus survey, October 2017

In summary, the socio-economic drivers of inflation expectations in SA correspond with the evidence in countries like the US (Bryan and Venkatu, 2001a) and Sweden (Jonung, 1981). In general, if you are a white middle-aged man with high income and educational levels you are likely to have (significantly) lower expectations for inflation than a young, Indian women with low levels of income and education.

While these descriptive statistics are revealing, they are unconditional. In the next chapter, this data is evaluated more formally using regression analysis.

CHAPTER 5
RESULTS: REGRESSION ANALYSIS

5.1 INTRODUCTION

In order to gain a deeper understanding of the underlying relationships between a range of socio-economic factors and household inflation expectations, an econometric analysis was conducted in which the relationships are conditional. This was also done for the definitional questions of the quantitative survey in order to test the extent to which demographic factors determined whether respondents chose the correct definition for the terms 'inflation' and 'the increase in prices in general'. This chapter provides the results of the econometric analysis.

5.2 RESULTS: SOCIO-ECONOMIC CHARACTERISTICS AND HOUSEHOLD EXPECTATIONS

To investigate further the extent to which socio-economic factors determine households' inflation expectations, a series of Ordinary Least Squares (OLS) regressions were computed. The econometric specification can be written as:

$$\pi_{it}^{e} = \alpha_{0t} + \beta_{0i}\Omega_{it} + \beta_{1i}\Omega_{it} + \beta_{2i}\Omega_{it} + \beta_{3i}\Omega_{it}$$

, where:

π^{e} is the 12-month ahead inflation expectations of individuals i, surveyed at time t. As outlined below, different versions of the dependent variable were tested.

t is October 2017

Ω is a vector of socio-economic determinants of inflation expectations. In this case, gender, race, education, household income[38] and age were considered. As outlined in the previous section, the literature suggests that these rank as the key socio-economic drivers of household inflation expectations. For the income and age variables, broader categories were created that grouped together the data provided by AC Nielsen. In the case of income, for example, AC Nielsen has 28 categories, ranging from R1 - R499

[38] AC Nielsen provided data for both personal and household income. To be consistent with the other socio-economic characteristics that are unique to a specific individual, the initial series of regressions for this part of the study used personal income as one of the explanatory variables. However, against economic theory, personal income proved not to be a significant driver of inflation expectations. On closer inspection, the researcher found that 20% of the respondents who answered the inflation questions either stated that they had no personal income or did not know/refused to answer the question. The majority (70%) of these respondents reported some level of household income, significant income in some cases. Using personal income meant that potential important information regarding the income effect on expectations would be lost. For example, a housewife may not have any personal income, but could have substantial purchasing power through household income and have a different experience (through the goods and services purchased) of inflation than implied when using personal income. To be sure, the number of respondents falling in different income categories changes significantly if one moves from using personal to household income. In particular, a much larger share of the respondents fall in the high income (R10 000+) category when household income is used. While a better measure, the use of household income also provides some challenges. About 13% of the respondents who were asked the inflation questions either refused to answer the question on household income or said they did not know. Underreporting of income levels is not uncommon as respondents with low income fear that they will lose access to a government grant once their income rises above a certain threshold, or – in the case of respondents with higher income – they try to evade higher tax payments.

to R20 000+ per month. Given the nature of this data, the income data was collected into four broader categories (R1 - R1 999, R2 000 - R4 999, R5 000 - R9 999, and R10 000+). A similar approach was followed for age, resulting in three age group variables (15 - 24, 25 - 29 and 50+). In addition, an interaction variable was included in the regression that combined a university or other tertiary education with household income of R10 000+.

Two sets of regressions were estimated, one with inflation expectations as the dependant variable and the other with prices in general expectations, as reported in Table 5.1. In all, eight regressions are presented[39], i.e. four versions for each of the two dependent variables were tested:

- The unanchored expectations, i.e. without the provision of any historic information on inflation.
- The anchored expectations, which included the provision of historic inflation data.
- The anchored expectations, excluding all expectations above 25%.
- The anchored expectations, excluding all values above 10%. This brings the mean expectation much closer to the median, i.e. the middle of the distribution.

Although the treatment of outliers is debated (see, for example, Aguines et al., 2013), the exclusion of expectations above 25% is in line with the method followed by the Bureau for Economic Research (BER)[40] so it is useful to include. It could be argued that the estimated coefficients of the socio-economic drivers of inflation expectations would be distorted if the outliers are not removed and the majority of the expectations are in a much narrower range. The counter argument is that if one specific socio-economic characteristic is responsible for the majority of the outlier expectations, one loses this information by excluding the outliers. This is particularly relevant for the comparison between race groups (refer to the discussion in section 4.5). Given this debate, the researcher tested the sensitivity of outlier values to various socio-economic drivers.

The reference group for all the regressions was a young (between the ages of 15 and 24), black male with primary school education and very low household income (R1 - R1 999 per month). The individual regression outputs for the eight regressions are provided in Appendix 4.

A larger set of socio-economic variables, including employment status, were also tested econometrically, but this did not improve the regression results. This is likely due to the

[39] Future research could, for example, explore a more extensive use of interaction terms in these regressions.
[40] Since the first BER survey in 2000Q3, this has consistently meant that about 2.5% of the responses were excluded.

presence of multicollinearity. For example, the education variable may very possibly explain a similar part of the variation of the dependant variable as the income and employment variables do. Indeed, Branson, Garlick, Lam and Leibbrandt (2012) show that educational attainment is the key driver of employment and household inequality in SA. To control for this, a smaller set of variables was selected and an interaction variable was included in the regression. The interaction term combined a university or other tertiary education with household income of R10 000+, i.e. high income. The interaction term was statistically significant in all of the inflation regressions and in two of the four regressions for prices in general. In all of the regressions, the coefficient of the interaction term suggests that a person with tertiary education and high income tends to have lower expectations for inflation and prices in general.

Table 5.1: Determinants of 12-month expectations (weighted data)

	Dependent variable: 12-month expectations							
	Inflation				Prices in general			
Independent variables	Un-anchored	Anchored	Anchored, excl 25%+	Anchored, excl 10%+	Un-anchored	Anchored	Anchored, excl 25%+	Anchored, excl 10%+
Constant	14.72*	10.04*	7.19*	6.59*	15.98*	12.99*	8.06*	7.30*
Woman	1.10	0.40	-0.32****	-0.00	0.81	0.37	0.18	0.17
White	2.30***	2.59*	0.97*	0.47**	-2.90**	-0.58	-0.05	-0.15
Indian	4.77****	7.27*	0.53	0.58**	4.09	6.39**	1.22***	0.52
Coloured	0.46	0.72	0.72*	0.42**	0.84	1.21***	1.15*	0.31***
High school	-3.06	-0.60	0.02	-0.02	-0.92	-2.40	-0.67	-0.75***
University, other	0.78	0.53	0.33	0.42	3.07	-1.33	-0.21	-0.64
Income: 2000-4999	0.08	-1.09	0.26	0.29	-2.26	-1.91***	-0.49	-0.21
Income: 5000-9999	-1.31	-0.80	0.13	0.16	-2.75	-2.06***	-0.50****	-0.00
Income: 10000+	-2.90***	-1.34	0.18	0.36****	-0.33	-1.32	-0.08	0.17
Age: 25-49	1.42	-0.74	-0.16	-0.41**	-0.14	-0.86	-0.11	-0.03
Age: 50+	-0.21	-1.66**	-0.52***	-0.41***	-3.74**	-1.61***	-0.36	-0.09
Interaction term:								
University Income 10000+	-5.71***	-2.93***	-1.10**	-0.97*	-4.37****	-2.16****	-0.57	0.06
Summary statistics								
R^2	0.02	0.04	0.03	0.03	0.02	0.04	0.03	0.02
F	1.84 (0.04)	3.72 (0.00)	2.81 (0.00)	2.04 (0.02)	1.86 (0.04)	2.56 (0.00)	2.36 (0.00)	1.37 (0.17)
Observations	1070	1070	1031	951	1071	1071	1037	958

Note: * ** *** **** signifies whether the T statistic is significant at the 1%, 5%, 10% and 15% levels of significance.

Source: Own research, data from AC Nielsen Omnibus survey

A feature of all the regression results in Table 5.1 is that the R^2 statistic is very low. However, this should not necessarily cause us to disregard these results as the significance of the R^2 depends on the purpose of the specific study being undertaken (Moksony, 1999). If the regression is used for forecasting purposes, it is important that the independent variables are able to explain a large part of the variation in the dependent variable. Therefore, if the aim is prediction, a high R-squared is important as it points to a small forecast error. Moksony (1999) argues that this requirement is lifted when the purpose of the research is to test a theory.

In this case, a low R^2 value merely indicates that the dependent variable is affected by a range of other variables in addition to the ones included in the regression. It is likely that a number of other factors besides demographics explain the heterogeneity of inflation expectations. For example, Burke and Manz (2011:3) found that 'economic literacy[41] accounts for much of the apparent demographic variation in expectations'. If – as is the case in this study – the intention is to establish a specific causal relationship between variables, as opposed to providing an exhaustive list of the determinants of a specific phenomenon, the R^2 is less important (Moksony, 1993:3). The lack of a time-series element for the OLS regressions (the panel dataset is for one survey only) may also contribute to the low R^2. Given that inflation expectations tend to be persistent over time (Fuhrer, 2015), a time-series element for this dataset is likely to improve the R^2. For example, Reid et al. (2018) ran regressions on AC Nielsen household inflation expectations data across five surveys with a R^2 of between 26 and 35%[42].

With the exception of the prices in general expectation that excludes all values above 10%, the model P values for all the other regressions are between 0 and 5%. The P value measures the probability that a random set of variables would be able to have the same explanatory power for the dependent variable as the chosen set of independent variables. The low P values of the regression outputs imply that this hypothesis can be rejected, in other words that at least some of the regression parameters are non-zero and that the regression equation does have some validity in fitting the data. This implies that the independent variables are not purely random and have some correlation with the dependent variable.

The coefficients of the explanatory variables used in the regressions largely confirm the descriptive statistics presented in section 4.5, although many of them are not significant. The gender variable is marginally significant in regression 3. In this case, relative to the reference group of men, the mean prices in general and inflation expectations are slightly lower for women respondents. However, this finding is not very robust across the regressions. The race

41 The authors include aspects such as an understanding of monetary policy, financial literacy (for example an understanding of compound interest) and numeracy skills in the concept of economic literacy.

42 In addition to socio-economic data, the authors included additional data series, which may also have contributed to a higher R^2.

variables are significant for a number of the regressions. Relative to the black reference group, the other race groups generally have higher expectations for inflation. While the picture is somewhat more mixed for the prices in general expectations with white respondents having lower expectations, a consistent theme is that Indian respondents on average reported significantly higher expectations than the other race groups. As with gender, the gap between the expectations of the different race groups is reduced notably in the regressions that exclude expectations above 25% and 10%. The dominance of the race variables should be treated with caution, as it is unlikely that race in and of itself would have such an impact on expectations. Rather, it is likely that the other socio-economic variables (such as income and education, or some other factor for which we do not have data) may also be reflected in the race variables. Given the dominance of the race variables and the risk of multicollinearity, the unanchored and anchored inflation regressions were also run excluding these variables (see Appendix 4). However, this did not change the coefficients or significance of the other explanatory variables in any meaningful way.

Only one of the education variables (high school) were statistically significant in regression 8. In this case, the sign of the coefficient is consistent with what the theory suggests. Relative to the reference group, who only have primary school education, the mean expectations of respondents with secondary school or tertiary education are lower. Finally, the result that respondents aged 50 years and older had lower expectations than the younger (between the ages of 15 and 24) reference group was statistically significant in regressions 2 to 6.

In summary, while the R^2 statistic implies that a number of other factors not included in this model (for which we do not have data) influence household inflation expectations, the regression results confirm that the socio-economic characteristics of the respondents help to explain their expectations. This is especially the case when all the values are considered (including outliers) and in the absence of an anchor number. The more robust findings of the model are that respondents over the age of 50, as well as those who have a tertiary education and household income above R10 000 per month, tend to have lower expectations for inflation and prices in general.

The next, and final, step was to test to what extent the unique characteristics of the respondents helped to explain their understanding of the terms ‘inflation’ and ‘prices in general’.

5.3 RESULTS: SOCIO-ECONOMIC CHARACTERISTICS AND ABILITY TO DEFINE ‘INFLATION’

A key focus of this study was to get a better sense of the SA public’s comprehension of the terms ‘inflation’ and ‘the increase in prices in general’. The relevance of socio-economic

characteristics in determining whether the AC Nielsen respondents were able to choose the correct definition for 'inflation' and 'the increase in prices in general' is formally tested in this section. A binary dependent variable was created to capture whether a respondent was able to define inflation (1 = correct definition, 0 = incorrect definition). A probit model was then used to fit a regression model where this dependent variable was (as with the OLS regressions) a function of a range of explanatory variables[43], namely gender, race, education, age, two income variables and two interaction variables.

All of the explanatory variables were categorical variables. Given the fact that this kind of data tends to be noisy and that there are only categorical variables to model a categorical dependant variable, the researcher decided to collapse some of the narrower classifications into broader categories. The first interaction variable combined respondents with a tertiary education and reported household income of R10 000+ per month. The second interaction variable combined the variables woman, black and very low monthly household income.

The probit regression results are summarised in tables 5.2 and 5.3. Regarding the summary statistics in Table 5.2, the pseudo R^2 values for both models are low. However, as argued in the previous section, given the type of single survey, panel data used here, these low values are not surprising and do not necessarily give reason to disregard the results. This is especially the case for probit models, for which Wooldridge (2002:465) argues that the 'goodness of fit' measures are 'not as important as the statistical and economic significance of the explanatory variables'.

Nevertheless, Table 5.2 provides an alternative goodness of fit measure, i.e. the count R^2. This is an additional measure of model adequacy (overall ability of the model to predict) or a measure of the percentage correctly classified (Reid, 2011:76). For the inflation definition model, the count R^2 value is 0.70 and for the prices in general model it is 0.66.

For a probit regression, the coefficients of the explanatory variables can only be interpreted after marginal effects have been calculated. Marginal effects measure discrete change, or how the predicted probabilities for the dependent variable change as the binary independent variable changes from 0 to 1. The odds ratio gives the probability that a respondent with a certain socio-economic characteristic is more or less likely than the rest of the sample to choose the correct definition of 'inflation' and 'prices in general'. The marginal effects and odds ratios are provided in Table 5.2.

The first point to highlight from the marginal effects is how small the coefficients of the independent variables are, for both the inflation and prices in general model. This suggests

43 While the exact variables used in the probit regressions are somewhat different from the OLS regressions, the same broad categories (gender, race, education, age and income) were used.

that there is less divergence between respondents than was the case in the OLS regressions that dealt with inflation expectations. Given that respondents only had two options to choose from in the definitional questions as opposed to the open-ended answers for the expectation question, this result is understandable. As outlined in section 4.5, almost 70% of respondents picked the correct definition of inflation.

Table 5.2: Socio-economic drivers of definition (weighted data)

	Dependent variable: Definition (correct = 1, false = 0)			
	Inflation		Prices in general	
Independent variables	Marginal effects	Odds ratio	Marginal effects	Odds ratio
Woman	-0.00	0.99	0.06****	1.29****
Black	-0.08*	0.67*	-0.04	0.82
University other	0.04	1.19	-0.03	0.86
Age 50+	0.05****	1.30****	0.01	1.06
Income: 1-1999	-0.06	0.76	0.03	1.16
Income: 10000+	-0.06**	0.75***	0.03	1.14
Interaction term: University other_10000+	0.07**	1.40**	0.03	1.15
Interaction term: Woman_black_1-1999	-0.06***	0.73***	-0.06	0.78
Summary statistics				
Pseudo R^2	0.02		0.01	
Count R^2	0.70		0.66	
Observations	1276	1276	1260	1260

Note: * ** *** **** signifies whether the T statistic is significant at the 1%, 5%, 10% and 15% levels of significance.
Source: Own research, data from AC Nielsen Omnibus survey

As reflected in Table 5.2, with the exception of gender, all of the socio-economic variables were more significant in the inflation regression. The researcher will therefore limit this study's discussion of individual socio-economic variables below primarily to the inflation regression. In the case of the gender characteristic, there is a statistically significant relationship between being a woman and correctly defining 'the increase in prices in general' but no statistically significant relationship with the definition of 'inflation'. Further evidence of this is provided in

Table 5.3. Expressed in percentage terms, the totals in Table 5.3 imply that for the ‘prices in general’ definition a statistically significant (at the 15% level) result was that a higher percentage of women (68%) than men (64%) chose the correct definition.

In the case of the ‘inflation’ definition, the race characteristic was statistically significant, although again the coefficient sign was relatively small. The marginal effect suggests that black respondents were somewhat less able to pick the correct inflation definition relative to the rest of the (non-black) sample. This is supported by the figures in Table 5.3, which reflects that while a majority of black respondents (about 65%) picked the correct definition, this was less than the 74% of non-black respondents that provided the correct answer.

The education variable would intuitively have been expected to be important but was statistically insignificant. It is possible that this could be sensitive to the threshold used to differentiate between the more and less educated parts of the population and so perhaps using a different threshold might improve the contribution of this variable. The age variable was significant in the inflation model, with older respondents (50 and above) more able to provide the correct definition. Only 26% of the 308 respondents in the 50+ category failed to pick the correct definition.

Table 5.3: Frequency table of socio-economic drivers

	Female			Black			Universityother			V50			1-1999			10000+			Universityother_10000+			Female_black_1-1999		
Inlfation definition	0	1	Total	0	1	Total	0	1	Total	0	1	Total	0	1	Total	0	1	Total	0	1	Total	0	1	Total
0	196	193	389	163	226	389	303	86	389	309	80	389	351	38	389	231	158	389	268	121	389	78	311	389
1	448	439	887	475	412	887	637	250	887	659	228	887	825	62	887	560	327	887	525	362	887	221	666	887
Total	644	632	1276	638	638	1276	940	336	1276	968	308	1276	1176	100	1276	791	485	1276	793	483	1276	299	977	1276
PIG definition																								
0	226	203	429	179	250	429	313	116	429	340	89	429	399	30	429	277	152	429	221	208	429	86	343	429
1	398	433	831	435	396	831	598	233	831	584	247	831	769	62	831	473	358	831	334	497	831	197	634	831
Total	624	636	1260	614	646	1260	911	349	1260	924	336	1260	1168	92	1260	750	510	1260	555	705	1260	283	977	1260

Note: PIG refers to prices in general. The explanatory variables in the table are women, black, university and other tertiary education, age 50+, household income of R1-R1999, household income of R10 000+, interaction term of university/other tertiary income and R10 000+, interaction term of women, black and household income of R1-R1999.

Source: Own research, data from AC Nielsen Omnibus survey

In terms of income, the variable for the low-income category was statistically insignificant, whereas the variable capturing high-income was statistically significant in the case of the 'inflation' definition. The negative sign on this high-income explanatory variable is however counterintuitive given the implication that respondents with income of R10 000+ were less able to provide the correct definition. This is in line with the odds ratio of 0.75 and the frequency table that shows that 67% of high-income respondents gave the correct inflation definition as opposed to 71% of the respondents that reported monthly household income of less than R10 000 that answered correctly.

This counterintuitive result may be caused by a strong correlation between income and education, so an interaction term that combines a tertiary education and high income was created. This proved to be statistically significant for the inflation definition – the coefficient sign is positive and the odds ratio implies that respondents with a tertiary education and income above R10 000 are 1.4 times more likely to provide the correct definition of 'inflation'. According to the frequency table, 75% of respondents with some tertiary qualification and household income of R10 000+ per month gave the correct definition of 'inflation'. Almost two-thirds of the respondents outside of this group gave the correct definition – still a relatively high percentage.

An interaction term that combines the characteristics woman, black and poor was also statistically significant in the inflation model. Relative to the rest of the sample, these respondents were less able to pick the correct definition of 'inflation'. However, at 68%, the majority of respondents that fell within this category provided the correct definition.

In summary, a majority of the surveyed respondents chose the correct definition of 'inflation' and 'the increase in prices in general'. The probit regression analysis of the definition of inflation showed that respondents that were both highly educated and had relatively high household income tended to have a better understanding of these terms. In the case of inflation, there is no statistically significant difference between women and men in terms of picking the correct definition. Older respondents displayed better knowledge of the term 'inflation' than younger respondents did. Finally, there is a statistically significant relationship between race and respondents' ability to define 'inflation'. However, given that there is not a reasonable explanation for this, and that race is likely to be highly correlated with more relevant factors which might be absent from the dataset, the interpretation of this is limited to an indication that race is capturing some other relevant factor.

CHAPTER 6
CONCLUSION

6.1 INTRODUCTION

In this study, a mixed methods approach was followed to explore the South African (SA) public's understanding of the term inflation with the aim to re-evaluate the validity of the Bureau for Economic Research's (BER) household inflation expectations survey.The main focus was on the wording of the BER's survey question, in particular whether it is appropriate to continue using the term 'prices in general' as opposed to phrasing the question directly about inflation. The BER had not explicitly tested the public's understanding of the term 'inflation' before this study. In addition, the impact of the inclusion of an anchor number in the survey question was investigated.

To answer the research question, a combination of qualitative and quantitative research methods was used to assess the SA public's understanding of the terms 'inflation' and 'prices in general'.

The first part of this chapter summarises the research project and provides the general conclusions of the study. This is followed by acknowledging some of the limitations of the study. Finally, a number of recommendations, including for future research, are provided.

6.2 SUMMARY AND MAIN CONCLUSIONS

Chapter 1 provided the motivation and research question for this study. Increasingly, central banks, including the South African Reserve Bank (SARB), rely on survey-based measures of household inflation expectations as an input into the conduct of monetary policy. This is because of the forward-looking nature of monetary policy and the effect that expectations are believed to have on inflation itself. Furthermore, surveys of household expectations provide a measure to gauge the credibility of the monetary policy regime.

The focus in central bank circles on managing expectations, in the hope of controlling inflation, implies that accurate measurement of the public's inflation expectations is essential. Measurement limitations could result in policy errors, to the detriment of real output performance and the attainment of stated inflation targets.

There are a number of challenges to measuring household inflation expectations accurately, one of which is concern about the public's lack of knowledge of the term 'inflation'. The public's perceived ignorance of inflation informed the current choice of wording in household inflation expectations surveys in a number of countries, including SA. However, the traditional way of phrasing the household inflation expectations survey through the use of simplified wording

such as ‘prices in general’ has been questioned in recent years. The impact of the inclusion of a historical inflation number in the question is also considered. Therefore, a re-evaluation of the validity of the BER’s survey wording is the research question.

In Chapter 2, an overview of the literature relevant to this study was presented. The emphasis on inflation expectations is deeply rooted in economic literature. Academics agree that expectations about future inflation influence consumption and saving decisions, as well as the broader business cycle. Furthermore, the expectations channel of the monetary policy transmission mechanism has become widely recognised as crucial to effective policy implementation.

A number of important theories in economics are based on an understanding of the role of expectations. Fisher (1930) was one of the first to focus on expectations, most notably in the theory of Uncovered Interest Parity. In a seminal Presidential Address to the American Economic Association, Friedman (1968) used inflation expectations to argue against the existence of a long-run Phillips curve. Lucas (1976) expanded on the earlier work on expectations, culminating in the rational expectations literature that, despite strong critique since the global financial crisis of 2008-9, still forms the basis for mainstream macroeconomic models.

After this motivation for a focus on expectations**,** the study provided a global overview of the survey wording used in household inflation expectations surveys. To assist households to answer the question about prices in SA, the BER inflation survey question provides respondents with the average CPI inflation rate of the previous five years and the previous calendar year. While it is not common practice to provide historic inflation data to survey respondents, international evidence does suggest that perceptions about the most recent (historic) inflation trends play an important part in forming household expectations about inflation in future.

Chapter 2 concluded with an overview of the critique against the use of the term ‘prices in general’ in inflation expectations surveys, which informed this study. In summary, Van der Klaauw et al. (2008) found that a household inflation expectations question phrased around the ‘rate of inflation’ as opposed to ‘prices in general’ was less prone to diverse interpretation. Furthermore, questions about inflation led to both lower levels of reported inflation and less disagreement among respondents about what they were actually asked to provide a forecast for.

Chapter 3 set out the methodology used in this study. A mixed methods approach was followed to explore the SA public’s understanding of the term ‘inflation’ and to explore whether changing the wording of the BER’s household inflation expectations survey would have any impact on

survey responses. The mixed methods approach focuses on the rigorous integration, or combining, of qualitative and quantitative research. In a sequential mixed methods approach, as followed in this study, qualitative data is collected first. In the next step, the data is analysed. The initial exploratory analysis is then used to inform the collection and analysis of quantitative data.

In the qualitative phase of this research project, a selected small sample of the public (27) was interviewed in order to get a sense of the terminology they use when speaking about inflation and how they understand specific inflation-related terms used by the interviewer. This addressed one of the aims of the thesis, i.e. to get a more informed sense of what the SA public understands about the term 'inflation' and the broader inflation process.

The data gathered in the qualitative phase was then used to develop a quantitative questionnaire. The questions for inclusion in the quantitative survey were informed by the transcribed narrative that was collected in the qualitative phase, as well as expert feedback that was part of the building phase linking the qualitative and quantitative parts of the mixed methods approach. The questionnaire was used in the subsequent phase of quantitative data collection.

Descriptive statistics and analysis of the qualitative and quantitative data were presented in Chapter 4. The main finding of the qualitative interviews is that there is no clear evidence that 'inflation' is a less understood term than 'prices in general'. In fact, the qualitative interview data indicate that the term 'inflation' may be at least as well understood as 'prices in general', and that a large proportion (78%) of the sample understood the term 'inflation' reasonably well. That is to say, they were able to pick the correct definition of 'inflation' when provided with two options. Furthermore, the qualitative interviews suggest that a non-trivial (around 40%) proportion of the public change their inflation expectations when provided with an anchor number, i.e. specific information on inflation (such as the latest official inflation figure and the SARB's inflation target).

As with the qualitative work, the quantitative survey results do not support the narrative that 'prices in general' is a term that the SA public understands better than 'inflation'. Indeed, a slightly greater share of survey respondents picked the correct definition of 'inflation' as opposed to the correct definition of 'the increase in prices in general'.

When an anchor number is not provided, mean household expectations for inflation were a percentage point lower than when households were asked to provide an expectation for prices in general. Finally, when an anchor number is provided, the impact of survey wording in influencing household inflation expectations is negligible. This is true both for the actual level of expectations and for the standard deviation of responses. However, the inclusion of the

anchor number has a sizeable effect on the mean and standard deviation of the expectations with both values declining. The anchor number seems to have a notable effect on the answers of respondents whose original expectations are furthest from the realistic figures.

The final part of Chapter 4 explored the extent to which socio-economic factors such as gender, race, level of education, age and income explain household inflation expectations. These drivers of inflation expectations in SA generally correspond with the evidence in countries like the United States and Sweden. In general, if you are a white middle-aged man with high income and educational levels you are likely to have (statistically significant) lower expectations for inflation than a young, Indian woman with low levels of income and education.

In Chapter 5, formal regression analysis was conducted to extend this data analysis. In particular, the chapter provides econometric evidence for the relationships between a range of socio-economic factors and household inflation expectations. This was also done for the definitional questions of the quantitative survey. While the R^2 statistic of the Ordinary Least Squares (OLS) regressions implies that a number of other factors (not included in the dataset used for this study) influence household inflation expectations and explain the heterogeneity of expectations between respondents, the regression results confirm that the socio-economic characteristics of the respondents help to explain their expectations. Demographics seem to be of particular importance when all the responses are considered (including outliers) and in the absence of an anchor figure. In particular, older respondents (50 years+) and respondents with some form of tertiary education and who reported monthly household income of R10 000+ had lower inflation expectations.

The probit regression analysis of the inflation definition question showed that respondents that are both highly educated and have relatively high household income tend to have a better understanding of the term ‘inflation’. Furthermore, there is no difference between women and men in terms of picking the correct definition. Older respondents displayed better knowledge of inflation than younger respondents did.

6.3 LIMITATIONS OF THIS RESEARCH

The benefit of confirming the results of the small sample qualitative interviews in a representative quantitative survey is that generalisable conclusions for the SA public can be made from the data. While the data used for this research is also rich in a cross-sectional sense, the conclusions of this study are still taken from a single snapshot, i.e. based on one qualitative and one quantitative survey. Ongoing research by Reid et al. (2018) that includes a time-series element to the socio-economic drivers of household inflation expectations should

– especially from an econometric modelling perspective – provide more statistically significant results.

6.4 RECOMMENDATIONS

6.4.1 Areas for further research

The work done for this study raises a number of questions for further research. One area of interest is the role of an anchor number in influencing household inflation expectations. This study provided preliminary evidence that the provision of historic data (an anchor number) has a sizeable impact, in other words it results in lower expectations relative to a question that does not provide an anchor number. Possible further scope for research includes testing the impact of a range of anchors. For example, instead of providing respondents with the historic inflation data, one could test how, if at all, expectations react if respondents are presented with the SARB's inflation target range or with the latest SARB inflation forecast.

Given the SARB's more recent and consistent communication that it would like to anchor inflation expectations at the midpoint (4.5%) of its 3 to 6% target, the provision of an anchor number of 4.5% in the inflation expectations survey would be of particular interest. Furthermore, respondents could be asked whether they believe that the SARB would be successful in bringing inflation down towards 4.5% over time and, if respondents answer 'Yes', to follow it up with a question on what period of time they would expect this to happen.

Finally, a deeper investigation into how the main socio-economic variables interact to influence inflation expectations would be a welcome addition to the literature on the drivers of household inflation expectations among the SA public. In particular, how race interacts with other variables in driving inflation expectations could be studied in greater depth than attempted in this study.

6.4.2 Recommendations for BER survey methodology

Based on the findings in this research project, especially the result that once an anchor number is provided, the impact of survey wording in influencing household inflation expectations is negligible, there is not a compelling case to argue that the BER should change the wording of its household inflation expectations survey. In other words, there is no need to change from the use of 'prices in general' to asking households about their expectations for 'inflation'. However, to the extent that the wording of the BER survey was informed by the view that a lack of understanding of the term meant that the public would not be able to answer a question

directly about 'inflation', there does seem to be sufficient evidence to argue that this concern should not play a role in any future survey design that the BER undertakes[44].

The BER's use of an anchor number is less clear-cut. For one, among the 13 household inflation expectations surveys analysed for this study, the BER is unique in providing an anchor. It was shown that the anchor number has a large impact on stated inflation expectations. It could be argued that the population represented by the survey sample do not have access to the anchor number. In theory, they could with relative ease look up the historic data, but the rational inattentive public are unlikely to incur the cost of doing so (Sims, 2003). Therefore, the provision of the anchor number raises questions about the generalisability of the BER household inflation expectations survey results.

For this reason, it is not clear that the SARB can claim to have been successful in anchoring household inflation expectations within the 3 to 6% target range if the information included in the BER household inflation expectations survey question provides a clear downward bias to the responses. During 2018Q1 and 2018Q2, household expectations for the current year (i.e. 2018) were within the SARB's inflation target range. As argued earlier, these issues support the case for further research on the role of an anchor number in household inflation expectations surveys.

6.4.3 Recommendations for central bank communication

The SARB has become more transparent over the years, now providing its underlying assumptions and forecasts as part of the bi-monthly Monetary Policy Committee (MPC) statement. Furthermore, the bi-annual Monetary Policy Review outreach sessions and the SARB roundtable discussions all provide greater access to MPC members and insight into how they are thinking about monetary policy. However, financial analysts and business people mostly attend these forums, in other words the SARB is mainly preaching to those who already have an above-average appreciation of monetary policy and the process of inflation.

The probit results in this study confirm the intuition that poorer households have less of an understanding of inflation. In order to reach this audience, the SARB may need to move its discussions and forums closer to poorer communities. This has already started to happen with Soweto added to the SARB's October 2018 Monetary Policy Review outreach programme. The increase in populist rhetoric, both globally and in SA, suggests that a greater appreciation from all spheres of society of the role of the central bank and the importance of keeping inflation

[44] Although this study found that a large part of the population does not adequately understand the term 'inflation', the term 'prices in general' was not understood any better.

under control is of particular importance at this time[45]. Given that this study found that younger people were less able to choose the correct definition of 'inflation', a greater focus by the SARB on school outreach programmes may also be worth considering.

[45] Kganyago (2018) provides a compelling argument against pursuing populist policies.

APPENDIX 1
QUALITATIVE INTERVIEW QUESTIONS

First round of questions

1.) Have you ever heard of the word inflation?

If respondents answer 'Yes', a number of follow-up questions are asked. If respondents answer 'No', move on to the second round of questions. The researcher wants to test the understanding of both 'inflation' and 'prices in general'.

2.) In your own words, explain what inflation means.

For those respondents who mention anything related to 'prices', probe if there are any specific prices that they associate with inflation or whether they understand 'inflation' to mean the change in the price of all goods and services.

2a.) Which of the following two statements best describe your understanding of inflation? Why?

- Inflation refers to an increase in the price of a specific good or service such as food or taxi fares.
- Inflation refers to an increase in the price of all goods and services.

3.) How (if at all) does inflation impact on your ability to buy the things you need/want?

Probe here to understand whether the respondent perceives inflation to be something negative/bad. (e.g. will be worse/better off financially, need to earn more income, need to make more provisions for future, etc.)

4.) Where do you get information about inflation?

Probe here for friends, family, media (TV, radio, newspapers), professional forecasters or government institutions such as the South African Reserve Bank or the National Treasury.

5.) Based on your own opinions and what you have seen and heard, what do you think the inflation figure is now?

6.) Do you think the current inflation figure is high or low? Explain.

7.) Do you think that inflation increased or declined in the past 12 months?

7a.) What do you base your answer on?

8.) By how much do you think that inflation increased (declined) in the past 12 months? *Probe for understanding of percentage.*

9.) By how much do you think inflation will increase (decline) in the next 12 months?

9a.) Explain your answer, why do you say inflation will increase (decline) by (x%) in the next 12 months?

10.) If I told you the latest inflation figure was 6.5% and the SA Reserve Bank aims to keep the inflation rate between 3% and 6%, how (if at all) would that change your belief (expectation) about inflation in the next 12 months?

Second round of questions

1.) In your own words, explain what 'prices in general' mean?

The idea is to ascertain whether respondents refer to the prices of goods and services that they regularly purchase (i.e. relative price movements), or whether they refer to the general price level (inflation) in South Africa. If respondents provide answers about the basket of goods that they purchase regularly, probe about which specific goods they are referring to.

1a.) Which of the following statements best describe your understanding of 'prices in general'? Why?

- 'Prices in general' refer to an increase in the price of a specific good or service such as food or taxi fares.
- 'Prices in general' refer to the goods and services that I normally spend my monthly income on.
- 'Prices in general' refer to an increase in the price of all goods and services in the country.
- 'Prices in general' is just another way to refer to inflation.

2.) How would you explain the differences, if any exists, between prices in general and inflation? Only ask this question to respondents who were able to define inflation.

Only ask the remaining questions to those respondents that mention a difference between 'prices in general' and 'inflation'. The questions end here for those that answer that there is no difference between 'prices in general' and 'inflation'.

3.) Do you think that prices in general increased or declined in the past 12 months?

3a.) What do you base your answer on?

4.) By how much do you think that prices in general increased (declined) in the past 12 months? *Again probe for understanding of percentage.*

5.) By how much do you think prices in general will increase (decline) in the next 12 months?

6.) Explain your answer, why do you say prices in general will increase (decline) by (x%) in the next 12 months?

Conclusion of interview

Is there anything that you can think of in relation to the questions you've answered or in relation to this project – your understanding of inflation and personal experience – that you have not said yet? [*Pause of about 3 to 5 seconds to allow the interviewee to reflect on this.*]

This concludes the interview. Thank you for your time. You have been most helpful. If you're interested we'll gladly share our research results with you. As we indicated in the consent form you signed, we can guarantee confidentiality of your answers and information, and confirm that we follow the protocol of Stellenbosch University with regards to ethics.

APPENDIX 2
QUANTITATIVE SURVEY QUESTIONS: AC NIELSEN SURVEY

Prices-in-general questions asked to one half of the sample

1.) By about how much do you expect prices in general to increase during the next 12 months?

2.) Over the past five years, prices increased by on average 5.4% per year. During 2016, prices increased by 6.3%. By about how much do you expect prices in general to increase during the next 12 months?

3.) Which of the following two statements best describe your understanding of 'the increase in prices in general'?

- Refers to an increase in the price of a specific good or service such as food or taxi fares.
- Refers to an increase in the prices of all goods and services.

Inflation questions asked to the other half of the sample

1.) What do you expect the rate of inflation to be during the next 12 months?

2.) Over the past five years, the rate of inflation was 5.4% per year. During 2016, the rate of inflation was 6.3%. What do you expect the rate of inflation to be during the next 12 months?

3.) Which of the following two statements best describe your understanding of inflation?

- Inflation refers to an increase in the price of a specific good or service such as food or taxi fares.
- Inflation refers to an increase in the prices of all goods and services.

APPENDIX 3
OVERVIEW OF THE AC NIELSEN OMNIBUS SURVEY

The Nielsen syndicated Omnibus Survey covers a scientifically drawn, representative sample of adults (15+ years) living in urban areas nationwide. Interviews are conducted in the homes of respondents using a structured questionnaire on CAPI, in the preferred language of the respondent.

A probability sample of 2500 households are selected using Nielsen's computerised household register (close to 6 million actual addresses in urban areas) and from maps for rural sampling. The sample is stratified by race, and within race, by community size within region.

Nielsen's syndicated Omnibus studies are specifically designed to offer clients the full benefit of research amongst consumers on a cost-effective basis. The questionnaires on these studies contain questions for various clients, and clients only pay for those questions related to their product or area of concern. The National Omnibus coverage is representative of ± 97% of the total adult population aged 15-99.

Interviewing method

Personal, at-home interviews are conducted using a structured questionnaire on CAPI (Computer-assisted Personal Interviewing) and interviewing aids. Interviews are conducted in the preferred language of the respondent.

Sample

A nationally representative 15-99 year old probability sample of 2500 is covered, drawn from Nielsen's household census of close to 6 million addresses in urban areas. The sample is disproportionately stratified by race, and within race representatively drawn across area within community size within region. The Omnibus sample includes South African citizens only and excludes mine workers living in hostels, live-in domestic workers and those who are institutionalised.

Weighting

The sample is post-weighted to reflect estimated population in 000s. Weighting cells used are province, community size, gender, age.

Sampling Methodology

Selection of communities: All metropolitan areas and urban communities with a total population of 100 000 or more are automatically included in the sample. Within provinces, other urban communities are first listed, in alphabetical order, within the size categories: 30 000 - 99 999, 8 000 - 39 999, 4 000 - 7 999, 500 - 3 999, and less than 500 and their cumulative populations listed. From each stratum so formed, a sample of communities will be drawn, using a standard random start, fixed interval technique. The sample required in rural areas is allocated to the regions and within regions, to magisterial districts pro-rata to population, on the basis of latest population estimates.

Selection of addresses

The Nielsen GeoFrame is used to select the actual addresses or geographical co-ordinates. The residential addresses in most (but not all) urban communities are listed in the Nielsen GeoFrame – the file comprises 5 750 465 addresses which are arranged alphabetically by suburb and, within suburb, by street name. For such communities, addresses are drawn using a random start, fixed interval technique. Three other addresses are then selected in the immediate vicinity of each address drawn from the register, to provide four interviews at a point.

The GeoFrame contains houses, individual flats, townhouses and cluster houses, hostel “beds” and non-transient informal dwellings. For areas not covered in the address register, GPS co-ordinates are provided.

Selection of respondents

Each address is pre-designated as one which is to provide a male or female respondent, in equal proportions. At each address, the individual to be interviewed is determined by means of a random grid, using the number of adults of the relevant gender within the household and their age order. Interviewers are instructed to interview respondents at the selected addresses irrespective of language. Substitution is allowed after three unsuccessful calls – all calls are made at different times and days of the week to maximise success. Alternately, the address to the left and to the right of the originally selected dwelling. At the substitute address, the individual to be interviewed is determined by means of a random grid, using the number of available persons at home 15 years old or older, and of the same gender as the originally designated respondent.

Other allowable reasons for substitution are:

No male/female

Vacant house/flat/room/plot/stand

On leave/ill/in hospital/mentally disturbed/deaf

Sensitive occupation

Interviewed less than 6 months ago

Refusal to complete interview

Language barrier

Security/not allowed in for security reasons/gate locked/inaccessible/dogs

Although AC Nielsen's sample is drawn within traditionally racially "segregated" areas, it does not substitute for "wrong race" and the selected respondent at a specified address is included into the appropriate population group sample. The gain is skewed towards the black sample.

APPENDIX 4
OLS REGRESSION OUTPUTS

Prices in general

1.) Unanchored expectation

```
. regress Exclanchorexpectation Female White Indian Coloured Highschool Universityother V20004999 V50009999 V10
> 000 V2549 V50 i.Universityother##i.V10000 [pweight = Weight], vce(robust)
(sum of wgt is   1.0262e+07)
note: 1.Universityother omitted because of collinearity
note: 1.V10000 omitted because of collinearity

Linear regression                               Number of obs     =      1,071
                                                F(12, 1058)       =       1.86
                                                Prob > F          =     0.0360
                                                R-squared         =     0.0214
                                                Root MSE          =     17.273
```

Exclanchorexpectation	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
Female	.8103407	1.18233	0.69	0.493	-1.509637	3.130319
White	-2.897204	1.475343	-1.96	0.050	-5.792135	-.0022731
Indian	4.087294	3.692265	1.11	0.269	-3.157701	11.33229
Coloured	.8415292	1.347026	0.62	0.532	-1.801618	3.484676
Highschool	-.9190453	3.192411	-0.29	0.773	-7.183223	5.345132
Universityother	3.074671	3.735231	0.82	0.411	-4.254633	10.40397
V20004999	-2.267846	2.076961	-1.09	0.275	-6.343277	1.807586
V50009999	-2.751326	1.914709	-1.44	0.151	-6.508385	1.005733
V10000	-.3283715	2.121491	-0.15	0.877	-4.491179	3.834436
V2549	-.1373394	1.676664	-0.08	0.935	-3.427303	3.152624
V50	-3.749166	1.65962	-2.26	0.024	-7.005686	-.4926456
1.Universityother	0	(omitted)				
1.V10000	0	(omitted)				
Universityother#V10000						
1 1	-4.371738	2.889331	-1.51	0.131	-10.04121	1.297732
_cons	15.9847	3.38978	4.72	0.000	9.333246	22.63616

2.) Anchored expectation

```
. regress Anchorexpectation Female White Indian Coloured Highschool Universityother V20004999 V50009999 V10000
> V2549 V50 i.Universityother##i.V10000 [pw=Weight], robust
(sum of wgt is   1.0262e+07)
note: 1.Universityother omitted because of collinearity
note: 1.V10000 omitted because of collinearity

Linear regression                               Number of obs     =      1,071
                                                F(12, 1058)       =       2.56
                                                Prob > F          =     0.0024
                                                R-squared         =     0.0360
                                                Root MSE          =     9.0613
```

Anchorexpectation	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
Female	.3666827	.5832266	0.63	0.530	-.7777295	1.511095
White	-.5835331	.6432503	-0.91	0.365	-1.845725	.6786583
Indian	6.386828	2.950675	2.16	0.031	.5969866	12.17667
Coloured	1.215553	.7018319	1.73	0.084	-.1615879	2.592693
Highschool	-2.409537	2.075406	-1.16	0.246	-6.481917	1.662843
Universityother	-1.339552	2.411342	-0.56	0.579	-6.071109	3.392004
V20004999	-1.910028	1.16965	-1.63	0.103	-4.205126	.3850699
V50009999	-2.064121	1.073653	-1.92	0.055	-4.170852	.0426106
V10000	-1.321011	1.255267	-1.05	0.293	-3.784107	1.142086
V2549	-.8635971	.8779768	-0.98	0.326	-2.586371	.8591766
V50	-1.610384	.9105328	-1.77	0.077	-3.397039	.1762718
1.Universityother	0	(omitted)				
1.V10000	0	(omitted)				
Universityother#V10000						
1 1	-2.164833	1.492499	-1.45	0.147	-5.093426	.7637609
_cons	12.9916	2.232223	5.82	0.000	8.611515	17.37169

.

3.) Anchored expectation, excluding all values above 25%

```
. regress AnchorexpectationExcl25 Female White Indian Coloured Highschool Universityother V20004999 V50009999 V
> 10000 V2549 V50 i.Universityother##i.V10000 [pw=Weight], robust
(sum of wgt is   9.9367e+06)
note: 1.Universityother omitted because of collinearity
note: 1.V10000 omitted because of collinearity

Linear regression                               Number of obs     =      1,037
                                                F(12, 1024)       =       2.36
                                                Prob > F          =     0.0055
                                                R-squared         =     0.0267
                                                Root MSE          =     3.0767
```

AnchorexpectationEx~25	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
Female	.1843623	.2103349	0.88	0.381	-.2283743	.5970989
White	-.0501025	.2781253	-0.18	0.857	-.5958631	.4956581
Indian	1.215718	.7345938	1.65	0.098	-.2257633	2.657199
Coloured	1.149197	.3051449	3.77	0.000	.5504161	1.747978
Highschool	-.6653565	.5200679	-1.28	0.201	-1.685877	.3551641
Universityother	-.2142037	.6169954	-0.35	0.729	-1.424923	.9965161
V20004999	-.4890881	.3830489	-1.28	0.202	-1.240739	.2625624
V50009999	-.5038125	.3273714	-1.54	0.124	-1.146208	.138583
V10000	-.0813897	.4417691	-0.18	0.854	-.9482658	.7854864
V2549	-.1090465	.3132693	-0.35	0.728	-.7237698	.5056767
V50	-.3629064	.3447765	-1.05	0.293	-1.039455	.3136427
1.Universityother	0	(omitted)				
1.V10000	0	(omitted)				
Universityother#V10000						
1 1	-.565708	.5136163	-1.10	0.271	-1.573569	.4421528
_cons	8.065925	.6214732	12.98	0.000	6.846419	9.285432

```
.
```

4.) Anchored expectation, excluding all values above 10%

```
. regress Anchorexpectationexcl10 Female White Indian Coloured Highschool Universityother V20004999 V50009999 V
> 10000 V2549 V50 i.Universityother##i.V10000 [pw=Weight], robust
(sum of wgt is   9.2424e+06)
note: 1.Universityother omitted because of collinearity
note: 1.V10000 omitted because of collinearity

Linear regression                               Number of obs     =        958
                                                F(12, 945)        =       1.37
                                                Prob > F          =     0.1727
                                                R-squared         =     0.0169
                                                Root MSE          =     2.0175
```

Anchorexpectationex~10	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
Female	.1652571	.1465757	1.13	0.260	-.1223945	.4529086
White	-.1465672	.1678788	-0.87	0.383	-.4760256	.1828912
Indian	.5242541	.3739067	1.40	0.161	-.2095294	1.258038
Coloured	.3055772	.1662673	1.84	0.066	-.0207187	.631873
Highschool	-.7530558	.4360066	-1.73	0.084	-1.608709	.1025974
Universityother	-.6369859	.4839765	-1.32	0.188	-1.586779	.3128071
V20004999	-.2090822	.2588458	-0.81	0.419	-.7170612	.2988968
V50009999	-.0024259	.2338976	-0.01	0.992	-.4614447	.4565928
V10000	.1735141	.2488679	0.70	0.486	-.3148835	.6619117
V2549	-.034438	.1900999	-0.18	0.856	-.4075047	.3386287
V50	-.0937628	.2225671	-0.42	0.674	-.5305457	.34302
1.Universityother	0	(omitted)				
1.V10000	0	(omitted)				
Universityother#V10000						
1 1	.0576675	.3293759	0.18	0.861	-.5887252	.7040602
_cons	7.302426	.4848374	15.06	0.000	6.350943	8.253908

Inflation

1.) Unanchored expectation

```
. regress Inflationexclanchor Female White Indian Coloured  Highschool Universityother V20004999 V50009999 V100
> 00 V2549 V50 i.Universityother##i.V10000 [pweight = Weight], vce(robust)
(sum of wgt is   1.0211e+07)
note: 1.Universityother omitted because of collinearity
note: 1.V10000 omitted because of collinearity

Linear regression                               Number of obs     =      1,070
                                                F(12, 1057)       =       1.84
                                                Prob > F          =     0.0379
                                                R-squared         =     0.0229
                                                Root MSE          =     16.151
```

Inflationexclanchor	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
Female	1.10917	1.093478	1.01	0.311	-1.036465	3.254805
White	2.306637	1.326556	1.74	0.082	-.2963456	4.909619
Indian	4.774901	3.052711	1.56	0.118	-1.215161	10.76496
Coloured	.4628017	1.271111	0.36	0.716	-2.031386	2.95699
Highschool	-3.066022	3.401535	-0.90	0.368	-9.740551	3.608507
Universityother	.781347	4.371862	0.18	0.858	-7.797168	9.359862
V20004999	.0823979	1.872405	0.04	0.965	-3.591656	3.756452
V50009999	-1.311603	1.780553	-0.74	0.462	-4.805422	2.182217
V10000	-2.905018	1.75784	-1.65	0.099	-6.354271	.5442354
V2549	1.423525	1.340621	1.06	0.289	-1.207055	4.054105
V50	-.2070684	1.49636	-0.14	0.890	-3.143241	2.729104
1.Universityother	0	(omitted)				
1.V10000	0	(omitted)				
Universityother#V10000						
1 1	-5.713373	2.990718	-1.91	0.056	-11.58179	.1550458
_cons	14.71855	3.561852	4.13	0.000	7.72944	21.70765

2.) Anchored expectation

```
. regress Inflationanchor Female White Indian Coloured  Highschool Universityother V20004999 V50009999 V10000 V
> 2549 V50 i.Universityother##i.V10000 [pweight = Weight], vce(robust)
(sum of wgt is   1.0211e+07)
note: 1.Universityother omitted because of collinearity
note: 1.V10000 omitted because of collinearity

Linear regression                               Number of obs     =      1,070
                                                F(12, 1057)       =       3.72
                                                Prob > F          =     0.0000
                                                R-squared         =     0.0385
                                                Root MSE          =     9.5112
```

Inflationanchor	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
Female	.3972651	.5677628	0.70	0.484	-.7168051	1.511335
White	2.590069	.7577342	3.42	0.001	1.103235	4.076904
Indian	7.27752	2.873852	2.53	0.011	1.638417	12.91662
Coloured	.7150704	.6065526	1.18	0.239	-.4751136	1.905254
Highschool	-.5959745	1.666217	-0.36	0.721	-3.865444	2.673495
Universityother	.5272418	2.19045	0.24	0.810	-3.770882	4.825366
V20004999	-1.097513	.9786619	-1.12	0.262	-3.017853	.8228284
V50009999	-.761	.9955683	-0.76	0.445	-2.714515	1.192515
V10000	-1.338825	1.099978	-1.22	0.224	-3.497213	.8195627
V2549	-.7359494	.8070989	-0.91	0.362	-2.319648	.8477489
V50	-1.658151	.8343378	-1.99	0.047	-3.295298	-.021004
1.Universityother	0	(omitted)				
1.V10000	0	(omitted)				
Universityother#V10000						
1 1	-2.939787	1.580324	-1.86	0.063	-6.040717	.1611423
_cons	10.04698	1.664518	6.04	0.000	6.780845	13.31312

3.) Anchored expectation, excluding all values above 25%

```
. regress Inflationanchorexcl25 Female White Indian Coloured Highschool Universityother V20004999 V50009999 V10
> 000 V2549 V50 i.Universityother##i.V10000 [pweight = Weight], vce(robust)
(sum of wgt is   9.8945e+06)
note: 1.Universityother omitted because of collinearity
note: 1.V10000 omitted because of collinearity

Linear regression                               Number of obs     =      1,031
                                                F(12, 1018)       =       2.81
                                                Prob > F          =     0.0008
                                                R-squared         =     0.0258
                                                Root MSE          =      3.074
```

Inflationanchorexcl25	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
Female	-.3189301	.2021251	-1.58	0.115	-.7155595	.0776993
White	.9724257	.2755013	3.53	0.000	.4318104	1.513041
Indian	.5326731	.382504	1.39	0.164	-.2179133	1.283259
Coloured	.7201973	.2723967	2.64	0.008	.1856741	1.25472
Highschool	.0194321	.5485716	0.04	0.972	-1.057028	1.095893
Universityother	.3253031	.6129393	0.53	0.596	-.8774659	1.528072
V20004999	.2565116	.3347433	0.77	0.444	-.4003542	.9133774
V50009999	.1275059	.3037683	0.42	0.675	-.4685778	.7235895
V10000	.1774767	.356386	0.50	0.619	-.5218584	.8768118
V2549	-.1585381	.2699862	-0.59	0.557	-.6883312	.3712549
V50	-.5213126	.2757926	-1.89	0.059	-1.0625	.0198745
1.Universityother	0	(omitted)				
1.V10000	0	(omitted)				
Universityother#V10000						
1 1	-1.104401	.4708647	-2.35	0.019	-2.028377	-.1804243
_cons	7.186197	.5799433	12.39	0.000	6.048176	8.324218

```
.
```

4.) Anchored expectation, excluding all values above 10%

```
. regress Inflationanchorexcl10 Female White Indian Coloured Highschool Universityother V20004999 V50009999 V10
> 000 V2549 V50 i.Universityother##i.V10000 [pweight = Weight], vce(robust)
(sum of wgt is   9.2250e+06)
note: 1.Universityother omitted because of collinearity
note: 1.V10000 omitted because of collinearity

Linear regression                               Number of obs     =        951
                                                F(12, 938)        =       2.04
                                                Prob > F          =     0.0188
                                                R-squared         =     0.0261
                                                Root MSE          =     2.0898
```

Inflationanchorexcl10	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
Female	-.0071531	.150128	-0.05	0.962	-.3017789	.2874726
White	.4746356	.1938278	2.45	0.015	.0942492	.855022
Indian	.5825969	.2973344	1.96	0.050	-.0009208	1.166115
Coloured	.4172191	.1959018	2.13	0.033	.0327626	.8016756
Highschool	-.0259874	.4138741	-0.06	0.950	-.8382137	.7862389
Universityother	.4151945	.4643386	0.89	0.371	-.4960682	1.326457
V20004999	.2943814	.266395	1.11	0.269	-.2284178	.8171806
V50009999	.160601	.2263454	0.71	0.478	-.2836009	.6048029
V10000	.3621657	.2532527	1.43	0.153	-.1348418	.8591732
V2549	-.4096257	.1743941	-2.35	0.019	-.7518735	-.067378
V50	-.406088	.2183953	-1.86	0.063	-.8346879	.0225119
1.Universityother	0	(omitted)				
1.V10000	0	(omitted)				
Universityother#V10000						
1 1	-.9729321	.3411441	-2.85	0.004	-1.642426	-.3034381
_cons	6.594579	.4400323	14.99	0.000	5.731017	7.45814

Inflation regressions excluding the race variables

1.) Unanchored expectation

```
. regress Inflationexclanchor Female Highschool Universityother V20004999 V50009999 V10000 V2549 V50
> i.Universityother##i.V10000 [pweight = Weight], vce(robust)
(sum of wgt is   1.0211e+07)
note: 1.Universityother omitted because of collinearity
note: 1.V10000 omitted because of collinearity

Linear regression                               Number of obs     =      1,070
                                                F(9, 1060)        =       1.99
                                                Prob > F          =     0.0369
                                                R-squared         =     0.0179
                                                Root MSE          =     16.168
```

Inflationexclanchor	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
Female	1.119328	1.092637	1.02	0.306	-1.02465	3.263306
Highschool	-2.86016	3.433342	-0.83	0.405	-9.597079	3.87676
Universityother	1.167679	4.38417	0.27	0.790	-7.434959	9.770318
V20004999	-.1833318	1.879619	-0.10	0.922	-3.871528	3.504865
V50009999	-1.476098	1.795531	-0.82	0.411	-4.999297	2.0471
V10000	-2.423266	1.736741	-1.40	0.163	-5.831107	.984574
V2549	1.429343	1.342124	1.06	0.287	-1.204178	4.062864
V50	.2430901	1.476409	0.16	0.869	-2.653927	3.140107
1.Universityother	0	(omitted)				
1.V10000	0	(omitted)				
Universityother#V10000						
1 1	-5.704627	3.014408	-1.89	0.059	-11.61951	.2102585
_cons	14.87461	3.586781	4.15	0.000	7.836615	21.91261

2.) Anchored expectation

```
. regress Inflationanchor Female Highschool Universityother V20004999 V50009999 V10000 V2549 V50 i.Un
> iversityother##i.V10000 [pweight = Weight], vce(robust)
(sum of wgt is   1.0211e+07)
note: 1.Universityother omitted because of collinearity
note: 1.V10000 omitted because of collinearity

Linear regression                               Number of obs     =      1,070
                                                F(9, 1060)        =       2.14
                                                Prob > F          =     0.0236
                                                R-squared         =     0.0108
                                                Root MSE          =     9.6337
```

Inflationanchor	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
Female	.390073	.5778764	0.68	0.500	-.7438386	1.523985
Highschool	-.339474	1.710541	-0.20	0.843	-3.695906	3.016958
Universityother	.9651634	2.301965	0.42	0.675	-3.551763	5.48209
V20004999	-1.427785	1.021664	-1.40	0.163	-3.432498	.5769283
V50009999	-.9710344	1.042953	-0.93	0.352	-3.017521	1.075452
V10000	-.7064607	1.061936	-0.67	0.506	-2.790196	1.377275
V2549	-.6909392	.8080621	-0.86	0.393	-2.276522	.8946438
V50	-1.067805	.8935895	-1.19	0.232	-2.82121	.6856003
1.Universityother	0	(omitted)				
1.V10000	0	(omitted)				
Universityother#V10000						
1 1	-2.961093	1.662063	-1.78	0.075	-6.2224	.3002145
_cons	10.27067	1.701119	6.04	0.000	6.932725	13.60861

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